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Off We Go!

SUMMER-TIME for 1931 ends to-morrow night—Summer ended long ago, if it ever began!

As we put the clock back and settle down to the evenings of longer lighting we really enter another Lighting Season with its boundless opportunities for all connected with the electric lighting trade; from the electricity supplier and the extensive lamp and cable manufacturing trades, down the whole range of electric lighting fittings, devices, and contrivances, right to the smallest electrical contractor and shopkeeping retailer.

Now for a big boost by everybody interested, making the lighting season in what may seem unpropitious times the brightest and the best on record! That it can be done if everybody determines it so we have not the shadow of a doubt.

Let us not be unduly influenced by things that are not all that they might be. Take full count of the factors favourable to progress and get on with the job! Surely, in the present situation there are grounds for anticipating larger lighting and power loads.

The October Sales and Publicity Programme adopted by the Electrical Development Association sets us all an example. It breathes an impelling enthusiasm. It is dominated by the almost universal need for More Lighting and Better Lighting. It declines to be diverted from its legitimate object in life, will not be silenced or suppressed by the financial situation. Indeed, it bravely climbs upon that economic dump to shout that out of even this experience good may come for the electric lighting community, because people will spend more upon the amenities of home than they have been doing, and less upon the more expensive away-from-home entertainments.

May we commend this idea to electrical men for rumination as they rest from their Faraday exhaustions, grateful to the renowned discoverer for perfect electrical illumination of the home and the warmth and cosy glow of the electric fire?

It is a quite reasonable assumption that the recent unparalleled demonstrations of floodlighting will have a psychological effect upon the multitudes who have been charmed by them, and that one of the practical results will be a marked movement toward better lighting generally. There is room for improvement in the lighting of public spaces and thoroughfares, in the illumination of public buildings, and in the use of electricity more pleasingly and efficiently in the home, not to speak of in the shops!

E.D.A. urges an immediate sales drive before floodlighting fades from memory, and we hope that electricity undertakings and contractors will act upon the suggestion forthwith.

The home may well be concentrated upon straightaway; special propaganda and educational literature to assist those entering upon campaigns of this class are available. The Association also intends to use its organisation throughout the country for following up last season's shop and display lighting campaign, and suitable literature is available for distribution among shopkeepers. We appeal to supply engineers and contractors to back up their organisation for all they are worth and thus secure a big success for the Autumn Lighting Campaign of 1931.

Wages and Salaries

The employers' side of the National Joint Industrial Council for the Electricity Supply Industry recommends those whom it represents to reduce the wages of their employés by the equivalent of ¾d. per hour as from October 15th. The steps which led up to this are set out in two letters which we summarise on a later page. It is clear from these that a situation has arisen which may have serious consequences. The employers claim that they have already made concessions to the men representing a total cost of over £1,300,000 since 1928. They consider that the time has come for the employés to agree to a reduction in wages which would bring them more in line with the cost of living and the general standard. They anticipate the obvious reply—that the industry is well able to pay the existing (or higher) rates—by maintaining that ability to pay is not the only consideration. It is stated that the supply undertakings are constantly being urged to lower their charges, and that this can best be facilitated by reducing wages. As the Unions, in terminating the existing agreement, put in a claim for an additional ½d. per hour, it will be seen that there is a clash of ideas. At the same time, the Unions advocated the abandonment of negotiation on a national basis in favour of district settlements. There may be something to be said for this, but it is surely unwise to jettison a system which has worked fairly smoothly without very good reason. In leaving the matter for the moment we may mention Alderman Walker's pronouncement at the E.P.E.A. dinner that, as power-station staffs' salaries had already been reduced as the cost of living had fallen, it would be grossly unfair to bring them into any general scheme of reductions.

A World-wide Tribute

Do Londoners realise that during the past fortnight or so their city has been honoured with the presence of most of the world's greatest scientists? They came both in acknowledgment of the debt owing to Michael Faraday for his enrichment of the world as few others have been privileged to do, and in admiration of the contributions to knowledge (hardly possible to appraise in value) which have emanated from the British Association for the Advancement of Science. The inaugural ceremonies of the dual centenary celebrations were broadcast by the B.B.C.; and from Boston, U.S.A., Dr. Frank B. Jewett, president of the Bell Telephone Laboratories, vice-president of the American Telegraph and Telephone Co., and past-president of the American Institute of Electrical Engineers, conveyed radio-telephonically greetings from kindred American societies, which, he said, did not yield to Britain in the expression of world-wide appreciation and respect.

The Control of Light

The Romans carried their torches in "fittings," and most elaborate ones were made to hold the candles and illuminate the night life of the Middle Ages. The fact that "fittings" are older than all modern forms of illumination inclines many people to take them for granted, whereas the introduction of electric lamps confronted designers with new problems. The very intensity of electric light was one of its early drawbacks; it caused "glare" and cast dark shadows. If the effect of glare is appraised in terms of discomfort, the candle-power of the glare-source is nearly twice as great in the case of a bare filament as in that of a diffusing surface. When a glare-source is appraised in terms of reduced visibility the degree of impairment is almost entirely a function of the intensity of illumination produced at the eye by the glare-source, the brightness and area of the glare-source being of little or no importance. If the same glare-source is appraised by both methods, a glare condition which may be judged quite uncomfortable will often be unaccompanied by any detectable reduction of visibility. It follows that a glare condition which appreciably reduces visibility is certainly an adverse condition for the eyes. Electric light must therefore be controlled, concentrated locally or diffused evenly, and adapted to its varied uses. That, in brief, is the function of "fittings." A large market awaits the electrical contractor's or dealer's efforts, one of its largest sections being his fellow shopkeepers.

Low-temperature Space Heating

The account given in this issue of the development of a low-temperature heating load by the City of London Electric Lighting Co., Ltd., should remove many doubts as to the possibilities of this class of business from the minds of supply engineers. The possibilities are immense, and further delay is inexcusable. But the task for the supply man will be a hard one, for the prejudice in favour of non-electrical central heating will require a great deal of breaking down. There is ample evidence available, however, that to push the l.t. load is safe and sure. While we do not necessarily agree with the City Company's ideas regarding the type of equipment—indeed, we have a leaning towards combined radiation and convection—the main issue is that it is tackling l.t. heating adequately and winning satisfied consumers. It will also, in time, win grateful acknowledgment from the electrical industry as a whole, for the surest way to help all concerned is for the supply industry to secure the maximum load, which implies additional business for the manufacturer.

R.E.B.C.

How little the tale of years has to do with a man's mental and physical fitness, or with his zest for life, is manifest to all who have the pleasure of coming into contact with Col. Crompton. His interest in present and future affairs is, moreover, enhanced by happy recollections of a host of eminent men with whom he has been associated in the course of his long life of service as an electrical pioneer, as an Army officer who once attempted to mechanise an army, and as one of the forces making for international concord. The decoration of the "top table" at the banquet given in his honour with flags of various countries aptly symbolised his work in the international sphere as well as being a compliment to the large number of distinguished men from overseas.

The Scientific Future

"Although we live in times fraught with difficulties, scientific progress does not slacken." In this phrase the King, in his message to General Smuts at the opening meeting of the British Association, summed up what was implicit in the presidential addresses of General Smuts himself and of many of the various section presidents. To the younger men this should be an exhilarating thought. They may be prone to regard the past, with its more empirical methods and with many accepted scientific laws still unformulated, as offering more scope for adventures of the mind than an age of increasing specialisation and more definite rules. But new discoveries spring from old, and to the youth of imagination, though he undergo hardships and though he be often disappointed and disillusioned, we think the present age offers more opportunities for the scientific approach to problems than any before. In his address to the Engineering Section, Sir Alfred Ewing applies to the late 'seventies and early 'eighties of the last century those fine lines from Wordsworth's "Prelude":

> "Bliss was it in the dawn to be alive,
> But to be young was very heaven."

They well fit the period Sir Alfred describes, but we think they are even more apt to the immediate future.

Low-temperature Space Heating

A definite challenge to central-heating systems with coke- or oil-fired boilers and hot-water radiators

IT cannot be too strongly stressed that by far the biggest field of future development for the electricity supply industry is that of space heating. The day is here now when electricity can be supplied at economic rates to permit of all-electric heating for all classes of buildings, and we urge supply engineers to throw off the shackles of prejudice, lack of confidence, &c., and to seize the immense opportunities of load development that space heating offers. Success, however, depends on the method of heating to be adopted, and it is sufficient to say that low-temperature systems have been proved to meet fully the requirements of all concerned.

Encouragement is received from several undertakings which are tackling the problem along the lines indicated, and some of the best work has been and is being done by the City of London Electric Lighting Co., Ltd., who during the past five

Large Hall at Premises of Darlington Fencing Co.

years of uphill fighting has gained considerable success as the result of a definite challenge to central-heating systems employing coke- or oil-fired boilers and hot-water radiators. Further, the company is definitely discouraging high-temperature radiators; these, it is claimed, are extravagant, have a very poor load factor, and cannot give satisfaction both to the supplier and the consumer. A result of the use of such radiators has been the creation of a psychology adverse to electric heating, and the first thing that comes to the mind of the average architect when presented with a scheme for electric heating is too expensive.

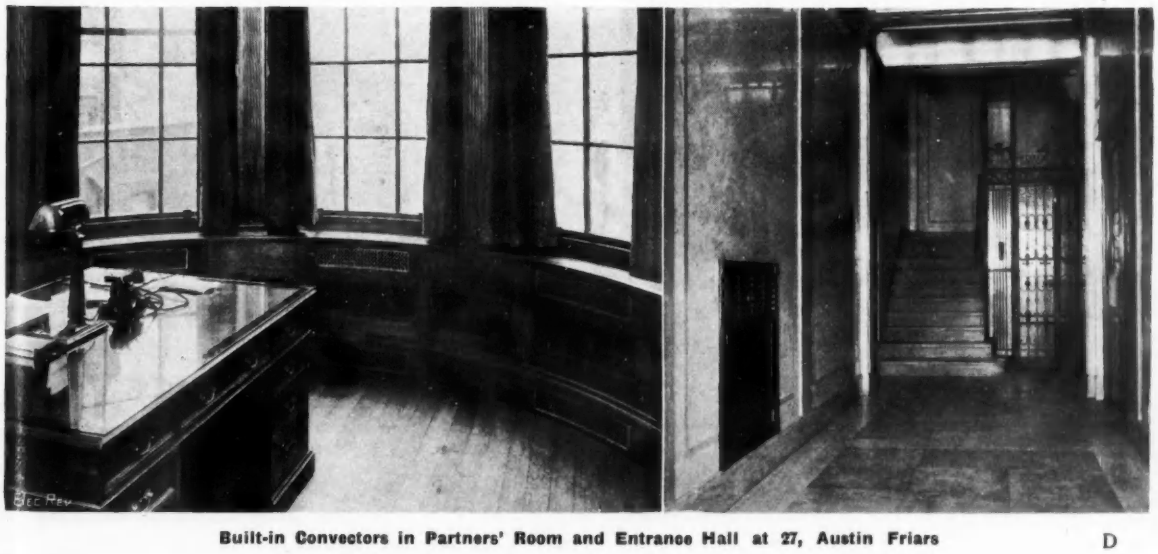
Mr. J. Lesser has been responsible for developing the l.t. heating load of the City Company since its campaign was first launched in 1926, and to listen recently to an enthusiastic expounding of his views and his company's success was stimulating indeed. High-temperature radiators in the undertaking's city area result in an average load factor of only five per

Convectors (500 W) in Vestibule of a City Office Building

cent., whereas the l.t. heating installed is responsible for an average factor of about 20 per cent. Records of individual installations of the l.t. type reveal many with factors between twenty-five and forty per cent., while figures exceeding fifty per cent. are shown for quite a number of cases. During the year 1930 some 315 l.t. consumers (whole year and part year), representing a maximum loading of 2,296 kW, were responsible for a consumption of 2,437,000 kWh—1,095,000 kWh night consumption and 1,342,000 kWh day consumption. These figures afford an interesting comparison in that the h.t. heating load for the year yielded only 400 kWh per kW. To indicate the progress being made in the l.t. work, the first year's efforts resulted in 279 kW with a consumption of 249,000 kWh; the consumption for the March quarter of this year was 1,575,000 kWh. The present tariffs for this class of supply by the organisation are 0.5d. per kWh for consumption between 7 p.m. and 10 a.m., and 0.75d. per kWh for consumption between 10 a.m. and 7 p.m.

It will be appreciated, of course, that the class of building in the City of London area—chiefly offices—stands alone, but, well, room heating is room heating. While the main object of the concern is to secure l.t. heating load, irrespective of the type of equipment employed—tubes, pure l.t. radiators, &c., convection apparatus is definitely encouraged. The aim is to secure a room temperature which will result in the rate of heat loss from the human body being neither too great nor too small, without vitiating the atmosphere. Against the appreciated arguments in favour of large radiating surfaces, the opinion is held that these conditions can more effectively be obtained by a skilfully planned system of convection currents of warm air. It is an essential characteristic of this method of warming that the temperature of the air discharged shall be as low as conveniently possible. The elements themselves never exceed 200° F., and the carefully proportioned case ensures an air outflow at a temperature not exceeding 95° F. The result is that the warm air is kept in slow and constant motion, thereby promoting the most efficient distribution of the warmth generated. Placing the convectors beneath windows and the resultant movement of warm air has been proved to deflect the course of the incoming cold air from the windows, and in consequence draughts have been avoided.

The following notes are extracted from a memorandum prepared by Mr. Lesser, comparing l.t. electric heating with central hot-water heating, and they indicate the company's attitude in its challenge to the latter system. The question



Built-in Convectors in Partners' Room and Entrance Hall at 27, Austin Friars

resolves itself into a consideration of two matters only, *viz.*, efficiency and costs. Electric l.t. apparatus does not depreciate by constant use over a long term of years, and its thermal efficiency therefore always remains at 100 per cent.

The capital costs for a central boiler system involve: provision and erection of a boiler; circulating pipes and panels

A Factory Installation

or radiators; erection of a flue; construction of a boiler-room, fuel store, and means of access for the delivery of fuel; and generally the installation of electric radiators to augment the central system. Similar costs for an electric l.t. system involve provision and erection of the wiring and the heaters.

The following operating costs must be considered for a central boiler system: cost of fuel; labour charges for attendance; interest on capital expenditure; sinking-fund charges; boiler insurance; value of space for boiler, fuel store and chimney shaft; cost of operating augmented heating; and maintenance charges. On the other hand, for the electric system: cost of energy; interest on capital expenditure; sinking-fund charges; and maintenance have to be taken into account.

The above items can be ascertained and expressed in terms of £ s. d., but the electric system possesses advantages which, though real, are difficult to assess at the outset in terms of cash. Examples of these are: constant thermal efficiency; the efficiency of a boiler decreases with age, which materially affects the consumption of fuel and increases the cost of augmented heating. Ease of control and economy in preventing waste of heat; the running costs with a boiler system are the same when rooms are unoccupied and during comparatively mild weather. An electric system can be controlled to regulate the temperature in accordance with the requirements of individual occupants of rooms, and wastage is avoided. Convenience for alterations when rooms are employed for varying purposes and also when partitions are erected; the electric system can easily and cheaply be altered to suit the changing conditions within a building, but this is a difficult and expensive process with circulating pipes, boilers, and radiators or concealed panels.

In putting forward its schemes for electric heating the company is continually meeting the argument based upon a comparison between the B.th.u. given up by different heating agents. It has been proved that different heating results can be obtained from the use of an identical number of B.th.u. in two buildings with identical conditions; it depends upon how they are employed. In central heating systems the hot-water radiators and circulating pipes are usually fixed against the walls, with the result that a large quantity of the heat is absorbed into the structure and is not usefully employed. That the structure will give up its heat when the radiators cool down is admitted, but there is a time-lag during the periods of absorption and surrender when the heat units involved are of no effective use to the occupants. This has been proved in several striking cases where electric l.t. heaters have been employed, with a B.th.u. output considerably smaller than would be necessary if hot-water radiators had been fitted.

The following notes concern a few of the actual installations carried out by the company. The Church of St. Lawrence Jewry, Gresham Street, has a volumetric capacity of approximately 100,000 cu. ft., and has been equipped with "P.H." convectors to the extent of only 31 kW. The consumption during the year 1930 was 33,000 kWh.

Until a short while ago the premises of the Darlington Fencing Co., Ltd., at 20, College Hill, were used as a school, and when they were taken over the Fencing Co. was seriously concerned as to the effective warming of the large hall, which is some 26 ft. high, and was to be used as the general office. The whole building is now equipped with l.t. convectors and two tubular heaters fixed beneath the glass skylight in the hall. The tenants have testified to the high efficiency of the electrical warming and the economic operation thereof. The consumption for the first six months of the year was 19,000 kWh, including the operation of a 3-kW urn.

No. 27, Austin Friars is a newly erected office building constructed for an eminent firm of stockbrokers, and is equipped throughout its nine floors for electric l.t. heating. The volumetric capacity of this building is 90,000 cu. ft., and the loading installed is 51 kW. The apparatus installed consists of 68 warm-air convectors and five tubular heaters. The heaters in the entrance hall and those in the partners' room on the first floor are recessed in the walls to conform to the decorative schemes of the architects. An undertaking was given that this installation would provide an internal temperature of 62 deg. F. with continuous conditions of 32 deg. F. outside. The supply of hot water is obtained from a 250-gal. calorifier fitted with a 6-kW immersion heater under the control of a thermostat. The consumption of the space-heating and hot-water installation during the first six months of this year was 50,000 kWh.

The company was called upon to deal with a factory occupying two large upper floors of a new building. A considerable amount of glass roofing in addition to windows resulted in a very large exposed surface. The volumetric capacity of both floors was approximately 100,000 cu. ft The load installed was 47 kW, and the equipment consisted mainly of convectors with the addition of a few tubular heaters, the whole being controlled by thermostats. In order to avoid a multiplicity of wiring and meters, the company allowed a load of 10 kW in respect of electric irons, an oven, urn and a kettle to be connected to the l.t. system meters, subject to a small surcharge on the load during the winter quarters. The consumption during a complete period of twelve months was 64,000 kWh.

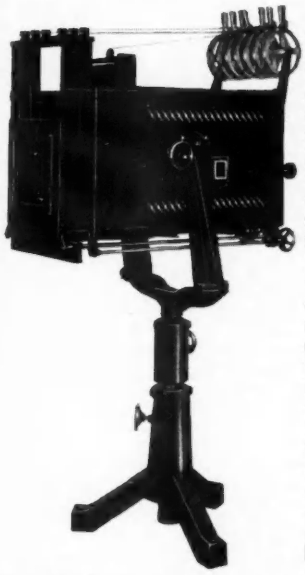
A distinctive feature of the l.t. heating at the residence at Guildford of Mr. John Kennedy, consulting engineer, is the introduction of convectors built into the wall-panelling with the outer cases designed to match the general decorative scheme arranged by the architect. Special coils were designed having a smaller diameter than those used in the standard models, with the result that the finished cases do not project more than approximately 6 in. In the principal rooms the convectors have been placed under thermostatic control.

L.T. Equipment in Drawing and Dining Rooms of Mr. John Kennedy's Home

Modern Stagecraft. By D. H. N. Caley

The success of the "White Horse Inn," the spectacular play now running at the London Coliseum, is due very largely to the electrical methods employed

THERE have been many outstanding spectacular productions in the English theatre, but for many years we have lagged behind both the Continent and America where this type of stagecraft is concerned. Now, with the advent of talking-film revues, it is more than ever necessary that the British theatre should look to its laurels in the matters of light, colour, and movement, and in the all-important question of satisfying that large section of the public which demands magnificence of scene rather than intricacy of plot or subtlety of thought. Such super-films as "King of Jazz," which combined a world-famous orchestra with a colossal pageant of scenic brilliance, show what the legitimate theatre has to contend with; it is plain that revolutionary changes in our theatrical methods are essential if large audiences are still to be attracted and held.



Magazine Arc Projector for Front of House; Throw upwards of 100 feet.

Such changes have occurred at the Coliseum, and directly or indirectly they owe their success to electrical methods. One of the most striking general features of "White Horse Inn"—the successful production now being presented—is the plastic scenery, but the effectiveness of this scenery depends as much on its adequate illumination as on the genius of the designers. The expert in charge of the design of the scenery was Professor Ernst Stern, who designed the Neuilly Fair scene in "Ever Green" at the rebuilt Adelphi Theatre and the Viennese Café scene in "Bitter-Sweet," both of which made great and remarkable use of electric lighting. The other special features at the Coliseum include a cyclorama, a complete and brilliantly conceived system of coloured lighting and a "revolving stage" which actually consists of three concentric turn-tables.

The cyclorama can be controlled from the switchboard, and it can be removed as required during the performance. In some productions removal is not necessary (as the cyclorama can be kept permanently in position), but where other types of scenery have to be substituted, it becomes essential to strike the cyclorama in order that the other scenery may be put in place.

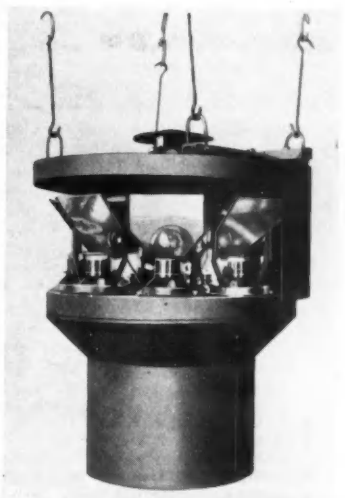
Lighting of the Cyclorama

Full rein has been given to the ingenuity of the designers in exploring the possibilities that lie in its illumination. The cyclorama is lighted from both above and below, and I will describe the upper lighting first and most fully. The main bank of floods for the cyclorama is disposed on the bridge. They are used with a special colour system of Venreco-Schwabe design, which, however, has been modified from the normal arrangement to suit the particular requirements of "White Horse Inn." Curved pieces of glass of a few natural colours are arranged in such a way that they can be combined to enable almost any secondary colour to be imparted to the light, the control being, of course, from the stage switchboard. It may be mentioned that the coloured glasses used are of so fine and durable a quality that up to the present no British glass manufacturing firm has been able to offer anything really suitable, although many have been approached.

The provision of cyclorama floods, or lanterns, on the bridge will also be found even more valuable in subsequent productions, as by their use it will be simple to make very effective changes from small exterior scenes to large ones. For the small exterior scene an ordinary backcloth would be used, in front of the cyclorama; as this backcloth was raised the cyclorama floods would be brought into action, making an excellent and easily managed transition from the smaller to the greater scene. For lighting the cyclorama from below, a series of trucks are normally wheeled behind the ground row, each truck being provided with six 500-W wide-angle floods.

General Stage Lighting

Starting at the front of the stage, there is a proscenium batten, consisting of eight 1,500-W lanterns. These have specially ground reflectors, and their use is stated to be new to this country. The float (or footlight) also departs from standard practice; its upper level is only two inches above the level of the stage, as seen by the audience in the stalls, and the construction has been arranged so that the wiring trough is at the rear of the float and easily accessible. The ventilation system is also designed in a novel way, with the effect that the heat rises on the auditorium side of the lamps. Lamps of 150-W capacity are used, and it is stated that they will fully illuminate a person six feet high at a distance of one foot.



Cloud Machine for use with 3-kW Projector Lamp

There are six battens. The spot batten has nine 1,000-W projector lanterns, fitted with round-bulb projector lamps, which are believed by the engineers to be more suitable for this purpose than any other type of lamp on the market. The design of the other battens, which are of the magazine type, is such that ventilation is between the lamps and the colour-medium, so that the colour projected on to the scene remains perfectly constant for a given setting. The wiring trough is at the back, and can be opened, exposing the whole interior. There are twelve acting-area lamps, and these are grouped in with the battens, thus saving valuable space—an important consideration in productions of the magnitude to be expected at the Coliseum.

Horizon Flood Lantern; Angle of Light 180 deg.

On the bridge are arranged several series of lamps, including spot lanterns, cyclorama lanterns and a cloud machine, and high wattage horizon floods with tracker-wire colour changers. Owing to the raising and lowering of the bridge, ingenious measures had to be taken to provide for the effective action of the tracker wire whatever its position.

There are two 3-kW cloud machines in addition to the above, enabling most realistic and often beautiful effects to be obtained. The machine consists of an arrangement of rotating mirrors, electricity being supplied

through collector rings at the top of the machine. Each machine has eight wide-angle lenses; the two are often operated together in such a way that (in conjunction with a wind-effect machine) an appearance of two clouds approaching or receding from each other may be readily obtained.

Colour-changing

In the dome are two high-amperage magazine arcs, fitted with mechanical colour-changing and vertical and horizontal shutters with iris diaphragms. A change-over system for the condensing lenses is provided, to enable a change to be made from long to short focus or vice versa.

Tracker-wire Control

Alongside the arcs (four on each side) are eight low-voltage, high-wattage projector lamps, of a type stated to be new to this country. Each of these lamps has a colour magazine, controlled by tracker wires from the stage switchboard. The length of each tracker wire is approximately 160 feet. These eight projectors are thus left unattended, and the remarkable coloured-lighting possibilities of the dome installation do not produce any heavy labour expense.

Along the exterior edge of the dress circle are eight high-wattage gasfilled lamp projectors, also with colour magazines controlled from the switchboard. These lamps, the provision of which is a significant innovation in the British theatre, are remarkably effective, and it is well worth noting that their use is only made possible by the remarkable tracker wiring. The length of each of the wires between the circle lamps and the stage switchboard is approximately 100 feet, in spite of the comparatively small distance if taken in a straight line. From the metal box which houses the lamps the wires pass to the non-synchronous room of the talking film installation, thence to the void under the stalls, through a very small aperture under one of the boxes, across some stone steps (which had to be chased out to have tubing run in), through a control room, and up through the stage to the switchboard gantry. Many of the pulley blocks have to be placed in such positions that the pulleys are more or less vertically above one another, and it is, therefore, essential that they should run very smoothly and that, for this reason, they should be very light, to prevent friction due to gravity.

Two switchboards, old and new, control the lighting installation, and it is worth noting that the old 68-way board takes up nearly four times the space of the 69-way new one.

The new section of the switchboard installation has a four-tier remote-control board and dimmer bank. The dimmer regulators have a master-control and a cross-control system, in addition to the usual individual control.

It will be seen from the above description that the installation is not only very elaborate but most ingeniously adapted to its various purposes, and great credit is due to Venner, Ltd., who have designed and installed the whole. The work had to be done against time, and in spite of the new problems presented by many aspects of the installation a record was achieved, the actual time from the laying down of plans to the opening performance of "White Horse Inn" being twelve weeks. It must also be remembered that the whole of the new electrical equipment, except the cloud machines, is of British manufacture.

Rapid Progress in Japan

MR. C. B. HIBBARD, of the Guaranty Co. of New York, in an article in the *Far Eastern Review*, estimates that there is an average of two and a half electric lamps per household in Japan, and mentions that electricty is used extensively for industrial and transport purposes. The use of electricity for lighting is not confined to the metropolitan areas, but is to be found also in almost every village.

Practically all the industrial establishments in Japan use electric power. Important sections of the Government railways have been electrified. The principal cities are, in addition, served by electric tramway lines, and in recent years there has been considerable extension of high-speed electric interurban lines. The Japanese Government has under active consideration further electrification of railways, which to a certain extent compete with the private interurban lines.

About 60 per cent. of the electricity used in Japan is generated by water power. In recent years the plants operated by steam have been progressing, the reasons being the increasing output of steam per pound of coal used and also the fact that with increasing industrialisation there has been a seasonal change in the peak demands. Large factories, electric railways, and the use of electricity for household purposes have all combined to relatively increase the demand during the winter months, which is a season of low water.

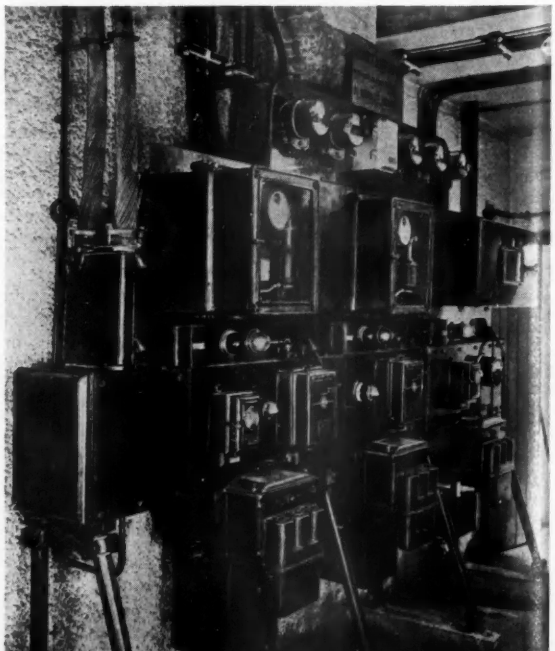
In relation to its area, Japan is richly endowed with water power as a result of the mountainous nature of the country and the heavy annual fall of rain and snow. Estimates of the actual water resources have, of course, varied. An official survey completed in 1923 gave the potential water power available as 6,415,000 h.p. A more recent estimate by the chief engineer of the Department of Communications listed the potential water-power capacity at approximately 13,600,000 h.p.

Japan's electric light and power industry dates from 1886, at which time the Tokyo Electric Light Co., Ltd., was established, this company being to-day one of the largest electric light and power operating companies in the world, its annual output amounting to more than 3,300,000,000 kWh. The growth of the electric light and power industry has, indeed, been one of the remarkable phases of Japan's economic and commercial development. At the present time the properties owned by the industry are valued at about £400,000,000, including a generating capacity totalling about 5,100,000 h.p. Power houses, either actually under construction, or whose construction is contemplated, will provide an additional 2,500,000 h.p. The period of greatest growth in the industry occurred in the years following the 1914-18 European war, the total installed generating capacity increasing by 337 per cent. between 1919 and 1928.

A marked inter-relationship exists amongst the important Japanese electric light and power undertakings; this is evidenced by inter-company holdings of capital and also by the fact that the larger companies interchange supplies. Of recent years actual competition has been sporadic in different territories, and the danger of internecine competition is now probably more theoretical than actual. The Government has intimated that in principle it is opposed to granting further competitive concessions.

Mr. Hibbard concludes his article by remarking that there are excellent reasons for looking forward with confidence to future electrical prospects in Japan. As the *per capita* consumption of electricity is still low (it has been estimated at considerably less than 200 kWh annually), there is every reason to expect an increasing consumption on the part of the Japanese. Sales programmes to place electric refrigerators, irons, vacuum cleaners, water heaters, etc., have been aggresively adopted, and there are indications that these sales campaigns are meeting, and will continue to meet, with considerable success. Nevertheless, the most important increases will be for industrial and commercial purposes.

A substantial percentage of the equipment used in Japanese power stations is of foreign manufacture, but more recent and present-day installations are likely to have been manufactured in Japan, the country being to-day almost self-sufficient in the manufacture of generating plant and electrical equipment.



Control Switchgear for Scottish R.A.C. Electric Boiler Installation (See next page)

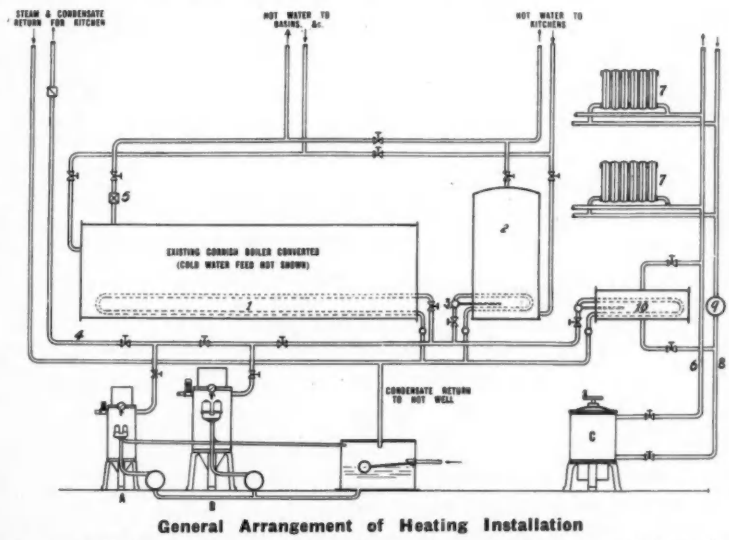
Heating by Electric Boilers

Serious space difficulties overcome by adopting electrical methods for room warming, hot-water and steam supplies at the Scottish R.A.C.

AN example of the progress that is being made in electrical space-heating installations is that just completed at the Royal Scottish Automobile Club, Glasgow. Until recently the heating of the building, the domestic hot-water supply, and the supply of steam for the kitchen were all obtained from a central Cornish boiler, but this became insufficient for the work. Situated as the boiler was, in the centre of the buildings, it was clearly a difficult matter to increase its size, and the only possible place for another coal or wood boiler was in the space now occupied by the club garage. An electrically heated boiler was decided upon, and the whole of the equipment has been placed in the small space hitherto used for coal and for firing the boiler.

The new installation has been supplied and erected by Bastian & Allen, Ltd., under the direction of Mr. J. Campbell Murray, M.I.E.E., consulting engineer, and has been designed so that the minimum space is taken for the equipment itself. The existing plant is made use of to its fullest extent, and the change-over from coal to electricity has been effected without inconvenience or, in fact, without the members or domestic staff knowing that such a change-over had taken place.

The existing Cornish boiler was converted into a thermal-storage tank for the domestic hot-water supply by blanking up the furnaces and inserting a steam coil 1 (shown in the diagram on this page) at the bottom; this is heated at night by either of the two boilers A or B, which are loaded at 150 and 350 kW, respectively, to the desired temperature, when the boiler feed pump and the boiler itself are shut down automatically. In order to reduce the heat losses in circulating, the temperature of the water in the piping is kept down to as low a point as is consistent with good service by means of a mixing valve 5, and while the temperature is adequate for wash basins and baths, it is not so for the kitchen purposes. A second existing storage is therefore used, also heated by either of the boilers during the night up to a temperature of 200° F. Both storages are controlled automatically in that a steam valve 3 closes when the storage 2 is hot, and a thermostat stops the boiler pump and so shuts down the boiler itself when the main storage is up to temperature.


STEAM & CONDENSATE RETURN FOR KITCHEN
HOT WATER TO BASINS, &c.
HOT WATER TO KITCHENS
EXISTING CORNISH BOILER CONVERTED (COLD WATER FEED NOT SHOWN)
CONDENSATE RETURN TO HOT WELL
A
B
C

General Arrangement of Heating Installation

The hot-water supply to the kitchen is thus taken in the first place from the special kitchen storage, and in the second place from the main storage, while any emergency steam can also be taken from the boiler which runs during certain hours of the day for providing steam for the kitchen cooking equipment. This equipment consists of four boiling pans, two steaming ovens, one steam oven, 6 ft. × 3 ft., one hot closet, 20 ft. × 3ft. × 3 ft., and three urns and two washing machines.

The boiler for day work has the ordinary patent controls, so that the steam supply and pressure are regulated by the steam demand, and, in addition, if the steam demand decreases and the pressure rises, the feed pump is automatically stopped to shut down the boiler. The beauty of the system is that the steam output automatically regulates itself to meet the demand of the moment, and as the steam is required for more

Royal Scottish Automobile Club

cooking pans the load on the boiler is opened out or shut off, so that no more steam is generated than is actually required; if no steam is wanted, none is supplied or paid for. The second boiler is left connected to the storage control and is automatically started up by a time clock, shutting down when the storage is up to temperature. The condensed steam is returned to the main feed tank, and the heat units therein are saved.

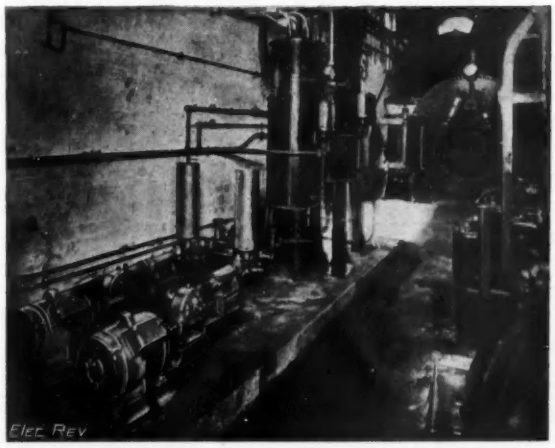
The heating of the building is on more simple lines and a 250-kW Bastian electrode circulator C is joined directly on the existing heating system, the hot water passing through the pipes 6, radiators 7, and return pipes 8 being accelerated when necessary by a motor-driven pump 9. This circulator is controlled in the main by water thermostats and contractors, and the load is altered from anything between 50 kW and 250 kW maximum to meet actual needs, while the radiator circuits are themselves controlled by magnetic valves and room thermostats to keep check on the room temperatures, which in practice reduces the running costs to a considerable extent, with an improvement in the general comfort of those who use the many rooms in the building.

The existing calorifier 10 through which steam was taken from the Cornish boiler has been retained as an auxiliary if and when the main circulator requires attention.

The photograph of boiler equipment, which was taken under considerable difficulty owing to the narrow space and is very foreshortened, shows the two steam boilers in the front, the 250-kW circulator midway, and, at the back, the existing Cornish boiler before being lagged. It also depicts the diminutive size of the electrical equipment in comparison with that for coal.

The method adopted for the change-over was first to install the two boilers and circulator, heat being provided in the building through the auxiliary calorifier while the circulator was joined up, and the domestic supply taken from the kitchen storage. The Cornish boiler was then altered and joined up, the whole change-over being effected without material interference; in fact, the actual change-over was made just before the lunch hour at peak load demand without anyone in the club being aware of it.

There is no thermal-storage for the heating, as it was considered preferable to have a smaller amount of heat continually day and night, the residual heat in the system and building being sufficient to cover any short peak load. The rates given at present are £10 per kW of lighting demand, ½d. per kWh during the day, and ⅜d. per kWh at night.



New and Old Boiler Plant: (Front to back) Feed Pumps, 250-, 350-, and 150-kW Boilers, and old Cornish Boiler

Automatic Voltage Regulators. By G. W. Stubbings, B.Sc., A.M.I.E.E.

The desirability of connecting an automatic voltage regulator so that it is responsive to the positive-sequence component of a three-phase system

THE object of using the positive-sequence connection for automatical voltage regulation has been explained in a previous article.* It will be recalled that when a voltage regulator is responsive to positive-sequence voltages, its performance on the occurrence of a single-phase short circuit depends only upon the severity of the short circuit, and not upon the pair of phases of the system between which the fault occurs. With the usual method of connection, in which the control of the regulator depends upon the voltage between two of the phases of the system, the performance of the regulator is unreliable when a single-phase fault occurs on the system.

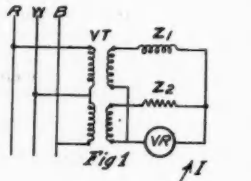


Fig 1

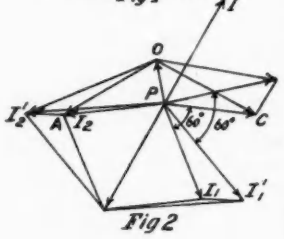


Fig 2

The positive - sequence component of a system of three-phase voltages can be obtained by compounding any two of the three single-phase voltages, with their phase separation diminished by 60 degrees. The application of this principle to obtain an electrical indication of the positive-sequence component is shown in the scheme of connections illustrated in fig. 1. Here Z_1 and Z_2 are two impedances of equal ohmic value, with their phase angles differing by 60 degrees. The two voltage transformers are connected on the primary side in open delta, but on the secondary side in star, with terminals of like polarity joined together. The phase difference between the two secondary voltages with a balanced system, is thus 120 degrees. The impedance which has the greater phase angle is connected to the transformer giving the leading voltage. If the impedance in the common return wire is negligible, the current in this wire will be $\sqrt{3}$ times, the ratio of the positive-sequence voltage to the ohmic values of the impedances Z_1 and Z_2, while the phase of this current will lead 30 degrees on one of the positive-sequence voltages.

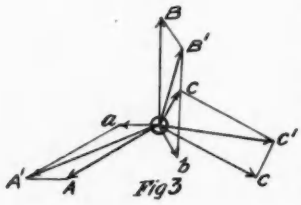


Fig 3

Connection of Control Circuit

If it is desired to connect an automatic voltage regulator so that it is responsive to the positive-sequence component of an unbalanced three-phase voltage system, then it is evident that the control circuit of the regulator should be connected between the common points of the transformer secondaries and of the two impedances Z_1 and Z_2. We have, hitherto, only established that the current in the common return of the two secondary circuits is proportional to the positive-sequence component of the voltage system if the impedance in this common return is negligible. The control circuit of a voltage regulator must, however, have a considerable impedance, and the effect of including this impedance in the common return connection between the impedances Z_1 and Z_2 and the transformer secondaries is that the voltages on the impedances are no longer equal to, or in phase with, the secondary voltages of the transformers. It would thus appear that, due to the impedance of the voltage regulator control circuit, the current in this circuit would no longer be proportional to the positive-sequence voltage. This, however, is not the case, and, whatever the impedance of the voltage regulator circuit may be, the current in this circuit is always proportional to the positive-sequence voltage, provided the characteristics of the two impedances Z_1 and Z_2 are correct.

The proof of this proposition by analysis is rather involved, but an indirect graphical demonstration is quite simple.

In fig. 2 we have the vector diagram of the currents and voltages in the positive-sequence network, the voltages of the system being balanced, and the control circuit of a voltage regulator being connected in the common return connection. OA and OC are the vectors of the transformer secondary voltages, and P is the vectorial representation of the potential of the common connection of the impedances Z_1 and Z_2 and the voltage regulator circuit. The voltages across these impedances are PA and PC, respectively. Assuming that Z_2 is non-inductive, and that the phase angle of Z_1 is 60 degrees, the current in Z_2 will be in phase with PA, while the current in Z_1 will lag 60 degrees behind PC. The vectors of the currents in Z_1 and Z_2 are thus I_1 and I_2, and the reversed resultant of these currents, I, is the current in the voltage regulator control circuit.

Unbalanced Voltage Conditions

Suppose that the three-phase voltage system becomes unbalanced, but the positive-sequence component of the voltages remains unaltered. The unbalance will be caused by the superposition on the original balanced system, of a negative-sequence component. We have represented the new conditions in fig. 3, in which OA, OB, and OC are the vectors of the original balanced system, *oa*, *ob*, and *oc*, are the vectors of the superposed negative-sequence voltage system, and OA′, OB′ and OC′, the resultant unbalanced voltage system. We see that the unbalanced voltages given by the voltage-transformer secondaries are derived from the original balanced voltages, by combining with these latter voltages two negative-sequence voltages which are 120 degrees apart in phase. The resultant voltages OA′ and OC′, are shown in fig. 3.

We now require to find the voltages on the impedance Z_1 and Z_2. To do this from first principles is somewhat difficult. Let us assume that the magnitude and phase of the voltage on the regulator is unchanged by the addition to the voltage system of the negative-sequence component. The potential of the star point of the three impedances of the network will be unaltered with respect to the common connection of the two voltage transformers. The voltages on the impedances Z_1 and Z_2 can now be obtained from the original voltages by compounding with them the negative-sequence voltages, and the currents in these impedances can also be obtained by combining, with the original currents, components proportional to the negative-sequence voltage, but with the phase difference altered by 60 degrees. An examination of the diagram will show that the 60 degree alteration in the phase of the added currents brings these currents into phase opposition, and it is also easy to see, from the geometry of the diagram, that the resultant of the currents in the impedances Z_1 and Z_2, as modified by the negative-sequence component, is the same as that of the original currents. On the assumption that the voltage on the regulator is unchanged, we have found that the current in this circuit is also unaltered. The assumption we have made is thus justified, and the superposition on the balanced-voltage system of a negative-sequence component has not altered the current in the regulator control circuit. It therefore follows that, whatever the amount of voltage unbalance may be, the current in the regulator circuit is always proportional to the positive-sequence component of the voltage system.

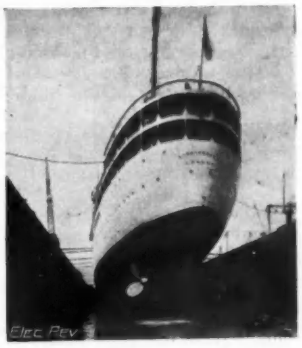
Regulator Impedance is Immaterial

When the impedance between the common connection of the impedance Z_1 and Z_2, and of the voltage transformers is negligible, the magnitude of the positive-sequence voltage is equal to $1/\sqrt{3}$ times the ratio of this current to the ohmic value of either of the impedances, and the phase of the positive-sequence voltage is displaced 30 degrees from that of the current in the common lead. When the control circuit of a regulator is connected in the common return lead, the positive-sequence voltage is not related to the regulator current in so simple a manner, as when the impedance in this lead is negligible, nor is the phase difference between the voltage component and the regulator current 30 degrees. The numerical relation and the phase difference now depend upon the characteristics of the regulator control circuit. This matter is of no importance in the operation of a voltage regulator, the only requirement being that, for constant values of the impedances of the network, the current in the regulator circuit shall be proportional to the positive-sequence component of the three-phase voltage system. This requirement we have found to be satisfied, and an automatic voltage regulator, with its control circuit connected in the manner shown, will be responsive only to the positive-sequence component of the three-phase voltage system to which it is connected, and will be unaffected by any negative-sequence component which gives rise to unsymmetrical voltages causing ambiguity in the performance of a regulator connected, in the usual manner, between two phases of the system.

* ELECTRICAL REVIEW, November 8th, 1929 (p. 791).

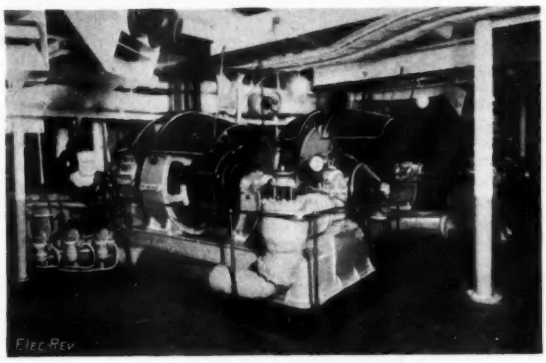
New Electrically Propelled Ships

Two sister vessels which have 28,000 s.h.p. of main propulsion plant and 2,650 kW of auxiliary generators

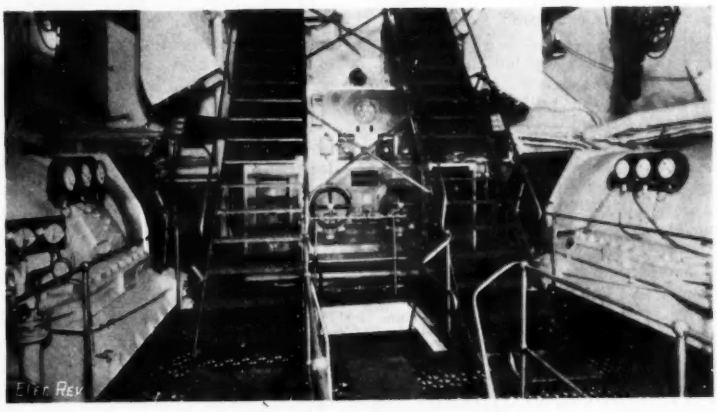


AMONG the outstanding ships of 1931, a notable position is assured for the *Strathnaver* and *Strathaird*, sister ships built by Messrs. Vickers-Armstrongs, Ltd., for the P. & O. Steam Navigation Company. The largest ships ever built for the P. & O. line, each has a length of 638 ft., a breadth of 80 ft., a draught of 29 ft., gross tonnage of 21,500 tons, and propelling machinery of 28,000 s.h.p., constituting them the most powerful electrically-propelled passenger vessels in the world.

Their turbo-electric propelling machinery has been supplied by the British Thomson-Houston Co., Ltd., which has supplied such equipment for nine vessels, totalling 109,800 s.h.p., besides a number of Diesel-electric equipments of various sizes. The propelling machinery typifies the modern marine use of high-pressure and high-temperature steam; since reversing elements are not necessary in the turbines, the initial steam conditions are not limited on that account.



Auxiliary Turbo-generators



Main Engine-room Control Panel

The main machinery consists of two separate turbo-alternator sets, each having its own condensing plant and auxiliaries; two double-unit synchronous motors, which are coupled direct to the twin propeller shafts; a contactor cubicle to control the power from the alternators to the propulsion motors; and two balancer booster sets for excitation purposes. The vessels can be propelled at about 19 knots with one main turbo-alternator set in operation, and at 23 knots with both main sets in use. The space occupied by the propelling machinery is not more than would have been required for any other form of machinery of the same power.

The turbines are of the impulse type, designed for a maximum steam pressure of 425 lb. per sq. in., and a total temperature of 725° F. They are fitted with stainless steel blading and nozzle plates throughout.

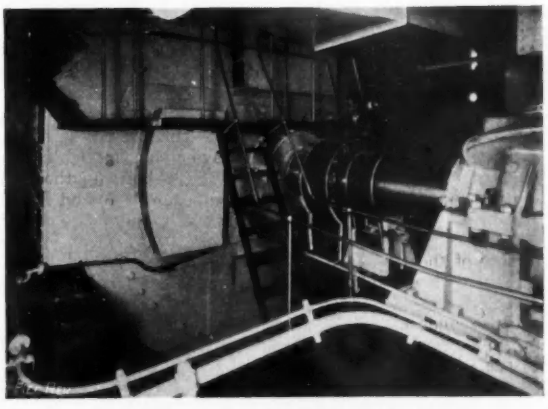
The design of the alternators was influenced by data obtained from the operation of similar machines in marine service. They are totally enclosed and self-ventilating, the air being forced through the machines by fans mounted at each end of the rotors; it is discharged into air coolers mounted below the alternators before it is again circulated through the machines. Embedded detectors are provided to indicate the temperature of the internal windings.

The term "double unit" as applied to the propeller motors means that each has two separate and distinct stator and rotor windings, and also two separate magnetic systems mounted in a common frame. In the event of one section failing electrically, it would be disconnected and the motor run at approximately half power. Fabricated steel construction has been employed, enabling the frames to be made extremely rigid, but permitting the weight to be reduced. The bearings are carried on facings provided on the fabricated endshields; they are self-lubricated by means of a disk fitted on the shaft at the outer end of each bearing, which dips into an oil well and the deposited oil is wiped off the disk by a scraper and circulates through grooves in the bearing liner. The motors are ventilated by motor-driven centrifugal fans, which draw out the heated air and discharge it through coolers into the motor-room, whence it re-enters the motors through openings in their endshields. Embedded detectors again indicate the temperature of the internal windings.

Two balancer booster sets are provided for obtaining, from the 220-volt auxiliary bus-bars, the power necessary for excitation purposes. One set suffices for all normal and manœuvring conditions, the second set acting as a standby for use in case of emergency.

Handwheels are provided at the forward end of the instrument panel for operating the isolator to enable each alternator to be electrically connected to its respective propeller motor, or either of the alternators to be connected to both propeller motors. There are six levers, arranged in groups of three, one group for controlling the port and the other the starboard side. The two outer ones are direction levers for ahead and astern rotation of the propellers; the two inner ones are field levers for controlling the excitation of the alternators and propeller motors, and the middle lever of each group is used for controlling the speed of the turbines from dead slow to 3,300 r.p.m. smoothly and steadily.

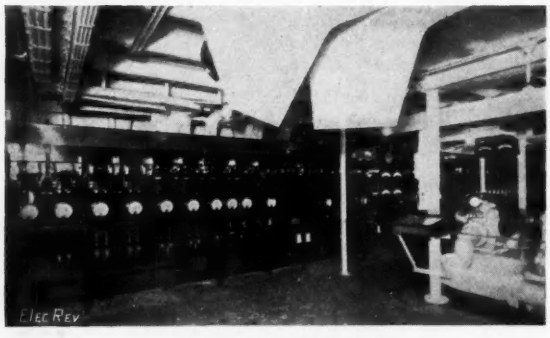
On the instrument panel and in the control cubicle all important gauges are centralised, enabling the operating staff readily to adjust any item of the equipment to ensure that the combined plant will operate at maximum efficiency under any conditions. The whole of the control cubicle is "mistake-proof," and special interlocks make incorrect switching impossible, so that no damage can be done to any portion of the equipment if manœuvred by an unskilled operator.



Propeller Motor, 14,000 s.h.p. at 125 r.p.m.

For supplying all the auxiliary, lighting, and cooking loads, three combined geared turbo-generator condensing sets have been installed, each of a capacity of 750 kW, 6,000/670 r.p.m., 220 volts, and for port duty there is a 400-kW, 4,500/1,000-r.p.m., 220-volt set of similar type.

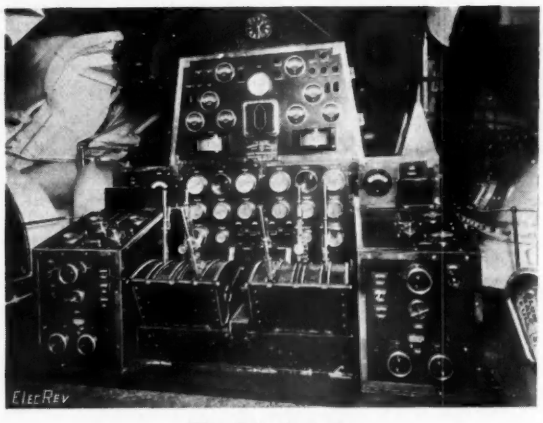
In contrasting the steam conditions employed in the latest examples of British and American turbo-electric marine practice, it is interesting to observe the different arrangements of boilers adopted. The *President Hoover* has twelve relatively small boiler units of the Babcock and Wilcox type with a total steam generating surface of 57,600 sq. ft., equivalent to 2.18 sq. ft. per s.h.p. of the main machinery. The *Strathnaver* has four Yarrow boilers of the largest size yet adopted in marine practice, with a total steam generating surface of 50,000 sq. ft., equal to 1.785 sq. ft. per s.h.p.



Main D.C. Switchboard

Both vessels employ steam turbo-generator units exclusively for the supply of auxiliary electric power, in contrast with the almost universal practice of employing Diesel generators, at least in part, for such service in modern geared-turbine liners.

An interesting innovation on board the *Strathnaver* is the employment of auxiliary water-tube boilers working at low pressure for port use, and the auxiliary generators are designed to work under the reduced pressure conditions. Cylindrical boilers have been employed for this service in previous high-pressure steam machinery installations. In the *Strathnaver* low-pressure evaporating plant is used for this duty. Steam bled from the main turbines is employed as the heating medium, and the vapour is utilised in the low-pressure feed heater so that no fuel is expended on the service.



The Main Controls

Swanscombe Grid Sub-station

SWANSCOMBE transforming station is at present the largest sub-station on the whole of the grid. It is an important switching centre, from which seven 132-kV circuits radiate over five separate transmission lines; provision has been made for two further circuits. It also contains two 20,000-kVA 132/33-kV transformers for giving supplies to Gravesend Corporation and the Kent Power Co.

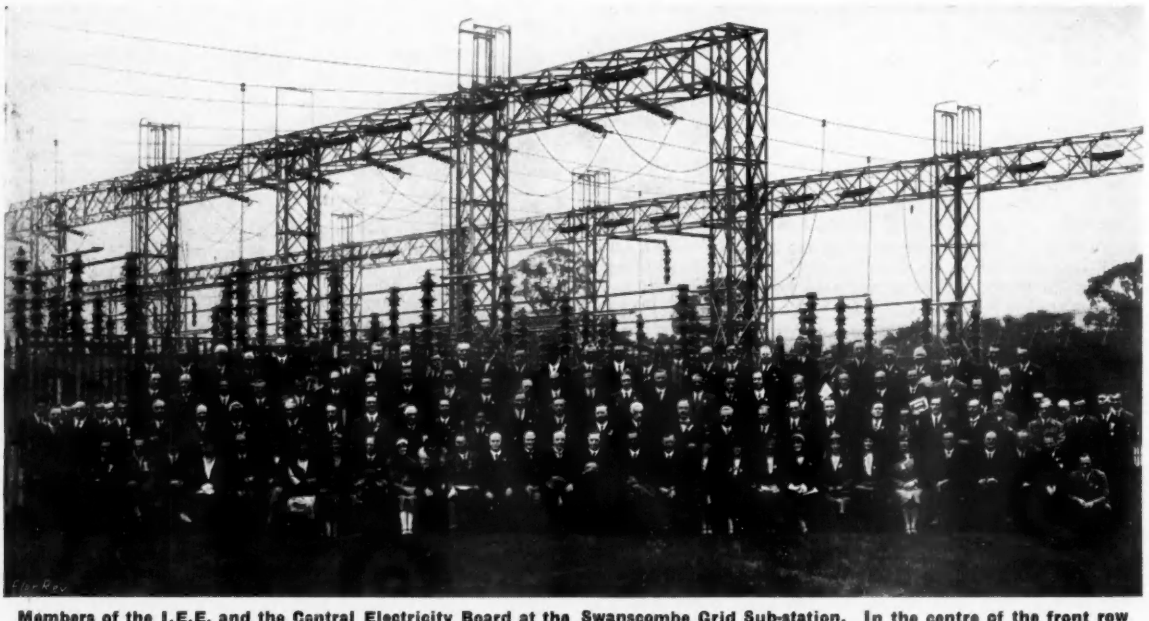
The present equipment comprises one bus-bar coupler bay, seven feeder bays, two skeleton feeder bays, and two transformer bays.

The construction is of the low double bus-bar type, in which each incoming 132-kV line terminates on a low steel gantry and then is carried, through isolating switches, to connections stretching across the station through an intermediate supporting gantry to a gantry on the far side. From these connections droppers are taken down to two groups of isolating switches which enable connection to be made to either of the two sets of bus-bars which run from end to end of the station at a low level on either side of the centre gantry.

Each circuit breaker, with its isolating switches, can be by-passed so that it can be inspected or replaced with the transmission line in service. The incoming line may be earthed through a special switch. The transformers are situated at the side opposite to the incoming transmission line.

The oil circuit breakers consist of three single-phase switches (each having four breakers in series) in separate tanks with a common solenoid-operated shaft. Their rupturing capacity is 1½ million kVA, and their rated current-carrying capacity 600 amperes. The condenser-type bushings are oil filled, and contain the instrument and protective current transformers.

The 20,000-kVA transformers are connected in star on the 132-kV side, and in delta on the 33-kV side—the standard practice on the grid. The 132-kV neutral point is solidly earthed, allowing the grading of the h.v. insulator. On the 33-kV side a neutral is obtained by means of a zigzag connected auxiliary transformer, the neutral of which is earthed through a liquid resistance. The secondary winding of this transformer gives a supply at 400/230 volts for forced-cooling plant and tap-changing gear, etc. The power transformers are oil immersed and self-cooled up to about half load. At a given temperature the forced-cooling plant automatically comes into operation, oil being circulated by a pump and cooled by air blast in a separate vessel. Remotely controlled on-load tap-changing gear gives a range of plus and minus 10 per cent.

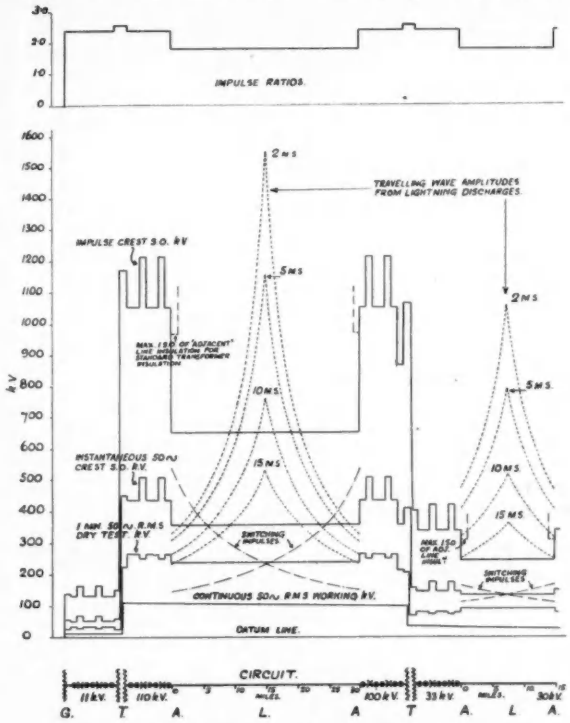


Members of the I.E.E. and the Central Electricity Board at the Swanscombe Grid Sub-station. In the centre of the front row are Alderman W. Walker, Sir Duncan Watson, Sir Archibald Page, Sir Andrew Duncan, Mr. Frank Hodges, and Mr. W. K. Whigham.

Overhead-line Insulation. By S. Austen Stigant, M.I.E.E.

Factors influencing the magnitude of disturbances and their effect on design

THE magnitudes of the disturbances set up on overhead transmission lines by lightning discharges depend upon various independent factors. These are, principally, the height of the line above ground, height of the cloud above ground, length of the cloud above and paralleling the line, type of cloud discharge (*i.e.*, linear or exponential rate characteristic), and the time taken by the cloud to discharge its accumulated electrical energy. Obviously cloud dimensions and positions are no function of the height of the line, while the type and rate of cloud discharge are not essentially dependent upon the size of the cloud. Suppose it be assumed that a cloud 2,000 ft. long paralleling the line, and at a height of 1,000 ft. above ground, discharges 95 per cent. of its energy exponentially in 10 microseconds immediately above the centre of the 110 kV line referred to in the accompanying figure. This would correspond approximately to the propagation of a travelling wave on the line and on each side of the point of discharge



Voltage Characteristics for Typical Composite System

which reaches its crest in 2 m.s. and its subsequent zero in 10 m.s.

The exponential rate of cloud discharge is considered more nearly to represent the actual conditions. The maximum voltage which can be induced on an overhead line by a lightning discharge is given by the expression, $E = \alpha\, gh$, where α is a factor depending upon the time of cloud discharge and length of the cloud, g is the lightning voltage gradient and is about 100 kV per ft., h is the height of the line above ground in feet.

For the cloud conditions cited above, the factor α is 0.28 for the maximum charge on the line during the forming period prior to separation of the two travelling waves, and it is $\alpha' = 0.23$ for the resulting free travelling waves.

Maximum Induced Voltages

The average height of single-circuit horizontally-spaced S.C.A. conductors above ground, taking account of the sag, is about 33 feet for a 110-kV line. Thus, for the line without overhead earth wires, the maximum induced voltage during the period the charge forms on the line is $E = \alpha\, gh = 0.28 \times 100 \times 33 = 925$ kV, while the crest value of each resulting travelling wave at the origin of the disturbance is $E' = \alpha'\, gh = 0.23 \times 100 \times 33 = 760$ kV.

For shorter discharge periods the induced voltages are correspondingly greater and *vice versa*, as shown in Table I.

TABLE I.

Cloud 2,000 ft. long. 1,000 ft. high.
110 kV. line. 30 miles long. Average height 33ft.

Discharge m.s.	α	E.kV.	α'.	E'.kV.
2	0.78	2,570	0.47	1,550
5	0.45	1,485	0.35	1,155
10	0.28	925	0.23	760
15	0.18	595	0.16	530

Now while the shorter discharge periods are infrequent they are not impossible, for lightning potentials as high as 2,800 kV have been recorded on lines. Therefore, in lightning areas overhead earth wires become an essential feature in the scheme of economic co-ordination of system insulation strengths. In the case of a single circuit line of horizontally spaced conductors the induced voltages are approximately halved by placing a single earth wire over the centre conductor; by arranging two earth wires above and spaced between the central conductor and each outer conductor the average induced voltage is reduced by approximately 60 per cent. Transmission lines equipped with overhead earth wires thus may quite legitimately carry less insulation than those without such provisions, without incurring the risk of danger to the terminal apparatus under surge conditions.

Surge Attenuation

A further feature which influences the question of co-ordination is that of surge attenuation; this naturally affects chiefly the standard of insulation strength of the terminal apparatus and the adjacent line insulation.

The magnitude of attenuation is given by the expression, $A = -k\, E^2_s$, kV per mile at any point where the voltage on the line is E_s.

The voltage at any point s on the line is $E_s = E_o / ksE_o + 1$, kV where E_o = initial surge voltage at the point of origin of the surge.

k = constant, varying for each particular line from 0.0001 to 0.0007.

s = distance in miles from the point of origin of the surge.

Taking $k = 0.00016$ (which is a value frequently found in the experimental investigations) and making $E_o = E'$, Table II is obtained for the 110-kV line, assuming this to be 30 miles long and the cloud discharge originating at the centre of the line.

For the same cloud conditions the corresponding data for the 33-kV line of the figure are given in Tables III and IV, assuming the average conductor height above ground to be 22.5 feet and the line 15 miles long.

TABLE II.

Cloud 2,000ft. long. 1,000ft. high.
110 kV. line. 30 miles long. Average height 33ft.

Distance of Point S miles from centre of line.	Es kV. for Time of Cloud Discharge of 2 m.s.	5 m.s.	10 m.s.	15 m.s.
E	2,570	1,485	925	595
O = E'	1,550	1,155	760	530
2½	960	790	580	435
5	690	600	465	370
7½	540	485	390	325
10	445	405	335	285
12½	380	350	295	255
15	330	305	260	235

TABLE III.

Cloud, 2,000ft. long, 1,000ft. high.
33 kV. line. 15 miles long. Average height 22.5ft.

Discharge m.s.	α	E.kV.	α'.	E'.kV.
2	0.78	1,755	0.47	1,060
5	0.45	1,010	0.35	790
10	0.28	630	0.23	520
15	0.18	405	0.16	360

TABLE IV.

Cloud, 2,000ft. long. 1,000ft. high.
33 kV. line. 15 miles long. Average height 22.5ft.

Distance of point S miles from centre of line.	Es kV. for time of cloud discharge of 2 m.s.	5 m.s.	10 m.s.	15 m.s.
E	1,755	1,010	630	405
0 = E'	1,060	790	520	360
2½	745	600	430	315
5	570	485	365	280
7½	465	405	320	250

Switching Impulses

The probable maximum amplitudes of switching impulses set up on the lines are also shown on the diagram, wave reflection being ignored. Investigations in the field have shown these to attain maximum crest values equal to about six times the crest value of the normal line-to-neutral working voltage. On insulated neutral systems, arcing grounds have also been found to produce disturbances of the same order of magnitude on the line. The curves on the diagram together with Table V,

TABLE V.

Based on probable maximum crest value of switching impulse $= \frac{E \times 1.41 \times 6}{1.73} = 4.9E$

Distance of point S miles from one end of line.	Es. kV. for 110 kV. line. 30 miles long.	33 kV. line. 15 miles long.
0	540	160
5	375	145
10	290	130
15	235	115
20	200	—
25	170	—
30	150	—

show that single switching impulses are not likely to produce insulation failures in a well-designed and co-ordinated system,

but repeated short-interval disturbances, coupled with wave reflection, may be productive of insulation failures.

The values given in Tables I to IV for different time lengths of cloud discharge are shown graphically by the dotted curves in the figure and so arranged they disclose certain features bearing upon the co-ordination problem. They show clearly that high voltage lines erected in lightning infested areas must be insulated very highly if they are to be proof against spark-over with very short-time cloud discharges, or alternatively one or more overhead earth wires must be associated with a lower standard of line insulation. They also show that while in some circumstances, such, for instance, as a cloud discharge at the *centre of a long line*, a reduced impulsive insulation strength of the line insulation adjacent to the terminal apparatus may not be called upon to exercise its function, it is necessary to make some such provision in order to safeguard the line ends against the effects of discharges near to the sub-station. This is indicated in the 110-kV section.

Wave Reflection at Terminal Points

It must also not be overlooked that wave reflection occurs at the terminal apparatus and voltages build up to amplitudes considerably higher than those of the arriving incident waves. Thus, the adjacent line insulation while possibly being ineffective for the arriving incident wave in certain circumstances, may be a very necessary means of protection against waves. Further, the impulsive voltage strength of the adjacent line insulation should be related directly to that of the terminal apparatus and not to that of the main line insulation.

There is a greater possibility of breakdown of terminal apparatus situated at the ends of short high-voltage lines as compared with those at the ends of long lines if due regard be not given to the provision of properly related adjacent line insulation. This is because on the shorter lines there is not the same scope for rapid attenuation as is afforded on long lines, and this is evidenced by the dotted curves of the 110-kV and 33-kV sections.

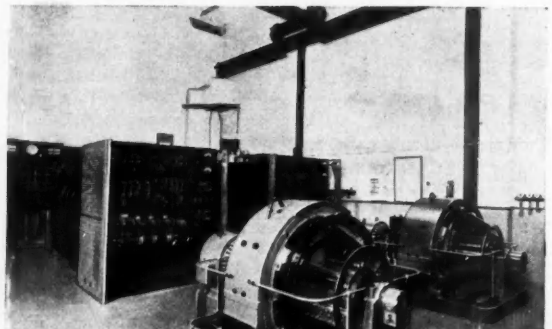
At the lower transmission voltages it is not so costly to insulate the lines to a very high degree as compared with the insulation of the terminal apparatus, and in such instances it becomes very important to co-ordinate the impulse insulation strengths at the ends of the lines.

In conclusion it may be noted that if a line insulator protects the terminal transformer by flashover for a given lightning wave, it will also protect it for other lightning waves as the ratio between lightning breakdown voltages of line insulators and transformers is more or less constant over a wide range of transients.

A Remotely-controlled Sub-station

Automatic equipment is reduced to a minimum in a new unattended sub-station at Stoke Newington

THE recently opened Wordsworth Road sub-station of the Metropolitan Borough of Stoke Newington electricity undertaking forms the first section of a comprehensive development scheme which will include a second sub-station for the northern district. A bulk supply at 10,000 V, three-phase, 50 cycles, is obtained through a main sub-station at Edwards Lane from the Hackney Borough Council, and the distribution is at 460/520 V d.c., three wire. The whole of the electrical equipment, which includes two 500-kW automatic rotary convertors (arranged for remote control from Edwards Lane) with transformers and the necessary switchgear for controlling the 10,000-V supply and the outgoing feeders, was supplied by the General Electric Co., Ltd. The



Equipment at Wordsworth Road Sub-station

convertors run at 1,000 r.p.m., and will deal with an out-of-balance current of 25 per cent. of the rated full load current in the middle wire. The switches controlling the incoming feeders are hand operated, while the machine oil switches are motor operated, the closing motor being energised by a 110-V three-phase 50-cycle supply from a special transformer.

Starting and stopping are effected entirely by means of remote push buttons and pilot wires from Edwards Lane sub-station, thus eliminating automatic devices which would be required for fully automatic working. The d.c. circuit breakers are also remote controlled. The rotaries are pony-motor started, and are capable of 25 per cent. overload for two hours.

Normal remote control is carried out from a panel equipped with indicating lamps, close and trip push buttons for the e.h.p. machine, oil switch and d.c. circuit breaker for each machine, voltmeters for reading the d.c. three-wire pressure at the sub-station, ammeters for the loading of each machine, and push buttons for regulating the d.c. voltage.

The starting sequence of each machine is initiated by means of the push button for the machine oil switch. The machine synchronises automatically, and its voltage is automatically regulated so as to be slightly above the network voltage and suitable for paralleling.

The synchronised machine is paralleled on to the d.c. network by means of the close d.c. circuit-breaker push button, and the voltage of the machine or machines on the network is regulated by means of the "raise" and "lower" push buttons. Changes in voltage and current are indicated on the remote meters. The machines are shut down by pressing the trip buttons to open the d.c. circuit breakers and the machine oil switch. As the machines shut down the switchgear is automatically reset ready for starting again.

The equipment is protected against overloads both on the a.c. and d.c. sides, earth leakage on the a.c. side, overspeed (by means of a centrifugal switch on the machine, also backed up by means of a frequency relay connected to the sliprings of the machine), and reverse polarity. The last named acts as a safeguard in extreme cases of fault or flash-over between brushes, as, normally, the machine always builds up its voltages with the correct polarity by means of an independent polarising field energised from a small motor-generator set.

Manipulation of a controller in the sub-station renders the remote-control gear inoperative, and the machines may be started and stopped as required by push buttons mounted on the relay panels. This method of control is intended for use during routine inspection of the plant. When locally controlled, the synchronising and voltage-balancing remain automatic, and all protective features are operative. Provision is made to operate the machines manually in an emergency.

During periods of very light load the machines are shut down and the distribution feeders are supplied from other sources.

We are indebted to Mr. Hedley Large, A.M.I.E.E., borough electrical engineer, Stoke Newington, for permission to publish this description.

Converters of Unusual Construction

Two large synchronous 5,440-kW, 25-cycle, 167-r.p.m. converters have just been installed at a chemical works at Niagara Falls. An unique feature of their construction, apart from their size, is the fact that a volute type of enclosure is employed which utilises the fan action of the rotor to force the heat-laden air from the machines and discharges it outside the sub-station. The effectiveness of this design was illustrated by the fact that at loads of 6,000 kW, or 10 per cent. overload, the bare copper temperature did not exceed 50 deg. C. rise, and that of all other parts was below 35 deg. C. rise. The efficiency of the machines at full load is 95.5 per cent. The d.c. voltage is adjustable in 16 steps by full-load tap-changing equipment mounted on the side of the outdoor transformers. The machines are started by the star-delta method of transformer connections, the breakers for which are placed in a compartment on the side of the transformers. During the acceptance tests one of the sets was suddenly called on to handle a current overload of 150 per cent., which was carried without any sign of distress or commutator impairment. The good performance is obtained by a flexible type of commutator and the use of double brushes.

Scientists in Congress

The relative prospects of steam and internal combustion engines; early electrical machines; electrical prospecting; and problems of factory management

THIS year's meeting of the British Association for the Advancement of Science will be memorable for the very large membership, which we understand was nearly 5,000.

Power

At the jubilee meeting of the Association in 1881, Sir Frederick Bramwell prophesied a very large future for the gas engine which, he implied, was destined to supersede the steam engine. Within a few months of his death, in 1903, he made provision for the preparation of a lecture "dealing with the whole question of prime movers in 1931, and especially with the then relation between steam engines and internal-combustion engines," to be given at the Centenary Meeting. The presidential address to Section G (Engineering), by Sir Alfred Ewing, K.C.B., F.R.S., was also the Bramwell lecture.

Sir Alfred points out that in 1881 the gas engine had the indefinite promise of youth, while no one foresaw the advent of Parson's steam-turbine, the first example of which was not built until three years later as "the product of sustained effort and unquenchable faith."

In the electric power stations of to-day steam is still dominant. In British stations oil and gas engines have an aggregate capacity of only 1¼ per cent. of the total; this is appropriate, since the turbine was invented for the express purpose of driving a dynamo. The turbine owes its position to its high thermo-dynamic efficiency (30 per cent.), which is partly due to the possibility of employing large units, but also to the far closer approach to the ideal Carnot cycle than is possible with the reciprocating engine; it also allows the adoption of regenerative feed heating. The steam turbine has immensely widened the range of the thermo-dynamic cycle by raising the upper limit of temperature through the use of higher pressures and superheat, which is limited only by the ability of the metallurgist to supply metal that will not "creep" too seriously. Superheating also tends to reduce the wetness of the steam at the later stages of expansion.

The steam turbine also has the merit of low capital cost, the cost for large British power stations varying from £14 to £16 per kW installed; for Diesel plant the corresponding cost is stated to be from two to four times as great.

Locomotives and Ships

In railway traction steam maintains its supremacy, with the help of higher pressures and superheat, and there is no indication that its place will be taken by oil. It is much more likely to be displaced by electric traction, in which case the prime mover will still be steam, except where water power is available. Switzerland has lost nothing of its charm through becoming dotted with power houses and spanned by graceful transmission catenaries.

On the road and in the air, on the other hand, the internal-combustion engine is supreme. The horse-power of high-speed i.c. engines is said to be more than ten times that of all power stations, ships, and railways; the 30 million motor cars in the world have a capacity of at least 600 million horse-power. These meet a new need, and are not competitors of the older uses of steam.

In the navies of the world, excluding submarines, steam has almost a monopoly, but in the mercantile marine the motor ship is, for the moment, in the ascendant. In 1930, of the 68 million tons of mechanically propelled shipping, 60 million were steamships and 8 million were motor ships, the motor tonnage having increased nearly fourfold in the preceding three years. Considerably more than half the tonnage launched last year was motor-driven, but tankers constitute more than 30 per cent. of the whole output, and seven-eighths of these were oil-propelled.

None of the largest and fastest ships, however, is motor-driven. Of marine engines under construction at the end of last March, 51 were turbines, with an average s.h.p. of nearly 20,000, and 328 were oil engines, averaging a little over 2,000 s.h.p. The list included 189 reciprocating engines with an average s.h.p. of about 1,000. The greatest competition occurs between steam and oil in medium-sized vessels, but practice in different countries varies widely. As an offset to the small thermo-dynamic advantage of the Diesel engine, its oil is more costly than oil fuel for boilers, and it has a higher capital cost. In weight and space, taking account of all auxiliaries, steam has, perhaps, a slight advantage. Modern Diesel engines must be compared with turbines working with high pressure and temperature, water-tube boilers, distilled water, and sound condenser tubes. Sir Alfred emphasises that the future of steam in marine propulsion depends on the use of high pressure and high superheat.

Reminiscences of a Pioneer

In a paper read before Section G, Prof. Elihu Thomson dealt with the subject of "Pioneering in Electrical Engineering Half a Century Ago," pointing out that it was not until about twenty-five years after Faraday's discovery in 1831 that magneto-electric machines of the Holmes and Alliance types were used, in some instances for lighthouses in which Faraday himself was deeply interested.

After expositions in 1876 in Philadelphia and at Paris in 1878, Prof. Thomson constructed a self-exciting, arc-lighting dynamo, doing practically the whole of the work himself. The weight of the machine was over 400 lb.; it was of the consequent-pole type with four equal field coils, and the armature winding was carried on an armature core of about 20 soft cast-iron plates with projections lined up together. The armature was wound two phase, with a commutator to each phase, connected in series and in quadrature to give direct current. On the shaft were also four collector rings to furnish two-phase a.c. if required.

Early in 1879 this machine was used at the Franklin Institute, Philadelphia, to operate a pair of shell-type transformers, connected in parallel with an eight-to-one ratio, supplying current to an arc lamp. Priority for this invention was awarded to Prof. Thomson over a number of claimants by the U.S. Patent Office.

The next invention was that of a three-phase machine, which was fitted originally with four three-segment commutators,

Prof. Elihu Thomson Recalls Events of 50 Years Ago

one for each circuit of the Y winding. It was used to supply 20 arc lamps, five circuits of four in series. Ultimately, all the commutators except one were removed, and it was found that the machine would supply nine 10-A arc lamps in series at the same speed of 900 r.p.m. The first three-phase alternator was evolved from this machine in 1882, by the substitution of three collector rings for the three-segment commutator.

The true function of the air blast used with arc-light machines was to ensure steady operation of the arc lamps, by the insertion of cold non-ionised air between segments, and not to "blow out the sparks." This idea anticipated much of the later and present work in the interruption of heavy currents.

Geo-physical Methods of Prospecting

On Friday, September 25th, Section A (Mathematical and Physical Sciences) discussed geo-physical methods of prospecting, with special reference to instruments. The first contributor to this discussion was Professor A. S. Eve, C.B.E., F.R.S. (of McGill University), who made a comparative study of three different electrical methods of prospecting for underground conductors, and gave a brief description of the apparatus and methods employed. The three methods described were the self-potential, the Radiore and the Gish-Rooney methods, as well as Lee's modification of the latter.

Comparative tests of the three methods mentioned were made a few months ago in an area in which a vertical vein of galena, occurring in metamorphosed limestone, had been worked from the surface to a depth of 1 400 ft. with a profitable output of lead. A few years ago a large number of conductors had been located in this region, whose "electrical axes" were at depths of from 100 to about 300 ft. The lines of these numerous conductors did not appear at first sight to conform with the line of the vertical fissure containing the galena. Exploration was begun with the self-potential method along the parallel lines, 200 ft. apart; it was found that the natural earth current flowed into points lying precisely on the lines of conductors as determined by the previous surveys, and

that the magnitudes of these currents bore a satisfactory relation to the intensities as found by the electromagnetic induction method.

It was not only a verification, but a clear indication that the conductors were vertical, reaching from near the surface down to many hundreds of feet. Inasmuch as the main mine contained both galena and pyrites, *i.e.*, valuable ore or lead and comparatively worthless ore of iron, it was of importance to ascertain the character of the ore. Unfortunately, the geophysicist was at present quite incapable of doing this; so that recourse must be had to deep trenching or the diamond drill. Hence it was important to discover those places over the conductors which seemed to offer the greatest prospects of success, where indeed the conductivity was high and the resistivity low.

The Gish-Rooney method was tried, and showed, as usual, better conductivity along the strike than at right angles to the vein, but otherwise no useful result was obtained. The Schlumberger electric probe or " single " electrode exploration, so useful in the case of horizontal underground conducting strata, did not render any better assistance. Finally, the Lee comparative method was used, and moving along the strike it was possible to infer the locality of the highest conductivity. Unfortunately, this could be used only along the strike where it was straight, as at a curve one half of the line of electrodes might diverge from the line of the conductor. Nevertheless, it was possible to fix certain points which appeared to be most promising for trenching or drilling. This exploration had not yet been undertaken, perhaps because, in view of the prevailing low prices of metals, there was not much incentive to develop mining properties.

Electrical Prospecting Instruments

Mr. A. B. Broughton Edge discussed some of the results of the work carried out in this country during the past twelve months, under the auspices of the Department of Scientific and Industrial Research, and with the co-operation of the British instrument manufacturers, with a view to producing a series of reliable electrical prospecting instruments and auxiliary equipment. The experience gained in Australia during 1928-30 by the Imperial Geophysical Experimental Survey, he said, had been applied to this purpose, particularly with regard to details of design which were essential for work carried out under rigorous field conditions. He discussed some of the instruments already completed.

Spontaneous Polarisation Method.—For the investigation of naturally occurring electrical phenomena, such as arise in the neighbourhood of certain types of sulphide ore-body, a portable d.c. potentiometer and non-polarising electrodes have been designed. The potentiometer has two ranges of 0-50 and 0-100 m.v., is self-standardising, and can be used on a tripod without any special attention to levelling. The non-polarising electrodes, with which contact is made with the ground, are either of the usual copper-sulphate type or else are of silver immersed in a chloride or sulphate electrolyte—the salts of potassium or sodium being employed as a rule. The electrolyte is contained in a porous pot, and by preparing it in the form of a jelly the electrode may be kept in use for long periods without attention.

Resistivity Method.—For the measurement of earth resistivities alternating current is commonly preferred, in view of the natural earth potentials and the electrode polarisation e.m.f's. when d.c. is used. The use of a.c. has its disadvantages, however, one of which is that the resistivity values derived are dependent on the frequency employed, and upon other factors difficult to appreciate. D.c. measurements can be made without difficulty if the potential electrodes employed are of the non-polarising type, and if all extraneous potentials are balanced before the current circuit is closed. The potentiometer described for the spontaneous polarisation method is provided with a special auxiliary circuit for this purpose, and has been found to be fully effective for resistivity survey work.

Ratiometer Method.—Hitherto one of the principal difficulties experienced in surface potential electrical surveys, in which a.c. is used has been to take proper account of the phase displacements that arise in the neighbourhood of concealed conductive deposits, and which are of prime importance when making a search for the actual position and extent of the latter. In order to overcome this difficulty a simple form of a.c. bridge or ratiometer has been devised which serves a variety of useful purposes. Potential and phase anomalies may be investigated along selected lines of traverse or a complete picture of the surface potential distribution may be obtained over a large area. In the latter case two distinct series of lines are followed over the ground surface and are known as equipotential (E.P.) and equiquadrature (E.Q.) lines respectively. These lines may either be traced directly over the ground with the ratiometer or they may be derived from observations made with the same instrument along a closed series of traverses. Since such a survey is so conducted that the potential spacing of the lines in each series is known, it follows that the surface ellipse at any point is determined by the angle of intersection of the E.P. and E.Q. lines that pass through it and by the line intervals in its neighbourhood. The author believes that this new method will prove more satisfactory to the electrical prospector than any hitherto developed.

Electrolytic Solutions

There was a general discussion in Section B (Chemistry) on Thursday, September 24th, on " The Influence of the Medium on the Properties of the Electrolytes."

The President (Brig.-General Sir Harold Hartley, F.R.S.) who opened the discussion, said that until recently most of our ideas about electrolytic solutions were based on experience in water and this gave quite a false impression of the simplicity of the problem since in water, thanks to its high dielectric constant and to the protection afforded by the chemical solvation of both ions, all uni-univalent salts exhibited almost ideal behaviour. A survey of non-aqueous solutions revealed at once a much more complex situation in which the chemical nature of the solvent and the affinities of the ions were often the predominent factors. Thus a purely physical theory—agreed to by Faraday—and followed by that of Debye and Hückel, while invaluable in explaining and predicting the behaviour of an ideal electrolyte, was far from giving a complete picture of electrolytic solutions even in the dilute range, since it left out of account the chemical nature both of the ions and of the solvent molecules. The task of the immediate future was to discover the precise nature and extent of the solvent atmosphere around the ions which exerted such an important influence on the properties of electrolytes.

Problems of Management

The Department of Industrial Co-operation of Section F (Economic Science and Statistics) arranged a very complete programme of discussion relating to industry. The first took place on Thursday, September 24th, when the subject of the " Aims, Methods and Progress of Research into Management Problems " was dealt with. Mr. B. S. Rowntree was in the chair.

Major L. Urwick (Director of the International Management Institute, Geneva), opening the discussion, said that a more scientific examination of business management would show the essential unity of management processes whatever their application and also the enormous benefits arising from this method of approach. Two principal difficulties retarded development. In the first place, the very volume of work that was being done and published made it difficult for the average manager to keep pace with new developments, despite the increased specialisation of function which characterised industrial organisation. Yet there were hundreds of factories in half a dozen countries attempting solutions of similar problems when there were at least 20,000 volumes relating to the management field, and when one country alone published over 100 periodicals a month devoted to these questions. A partial solution had been found in the publication by management institutions in different countries of digests of this literature. The same function was carried out internationally by the International Management Institute at Geneva. There was, however, no such institution in Great Britain. At the same time, even where such institutions existed the problem was a serious one. The second difficulty was more serious. However scientific the management in a given factory might be, the solutions of particular problems remained isolated. The test of effectiveness was limited to the broad issue of whether one enterprise made a profit as against another, which threw no light on the details of comparative performance. We knew practically nothing of the principles which should govern the administration of large scale combinations of previously independent units, so increasingly characteristic of modern business. Was is too much to hope that as far as Great Britain is concerned, the initiative taken by the British Association this year might develop into that integration of science and industry which alone could secure a new approach to the whole situation? Were it possible to agree as between the nations that the purpose of all economy was a higher standard of life for the world community, there would be no inherent impossibility in applying the conceptions and technique of management to every aspect and level of economic activity.

Sir Horace Wilson's Views

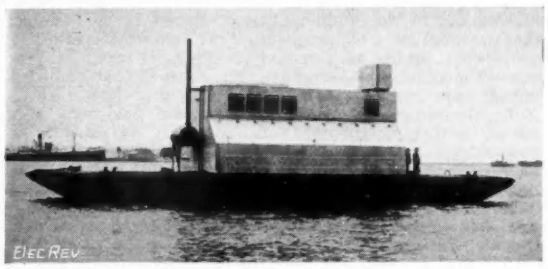
Sir Horace Wilson (Chief Industrial Adviser to the British Government) said that although the support that had hitherto been given to the management research groups in Great Britain by those concerned in industry, was a good deal less than the needs of industry demanded, considerable attention was being given to management problems here. Perhaps at no previous time had those responsible for the conduct of business been forced to think so hard about the difficulties that confront them and to strive, both individually and collectively, to discover some means of overcoming them. Many observers thought that the weak part of British industrial structure lay not so much in its plant or technical efficiency as in its organisation, but there was room for difference of opinion as to what types of organisation were best suited to British conditions. Few were even now prepared to define rationalisation; all that was agreed upon was that it comprised all changes which tended to increase efficiency. There was as yet very little experience to guide us in the management of large scale industrial units nor was it yet clear what were the limits of effective control of such units. It was to those actively engaged in the day-to-day work of administrating our larger business concerns that we must look for help, not only in discovering the principles that should be observed in organising the large units that appear inevitable, but in providing the men capable of managing them as and when they are formed.

The American and the Austrian positions were also discussed, the former by Dr. H. S. Person, managing director of the Taylor Society of New York, and the latter by Dr. Hellmuth Boller of Vienna.

A Floating Power-station

A NOVEL and interesting method of extending an existing electric power station has been adopted at Banjermassin, Dutch Borneo. When the electricity supply company took over the station they could not obtain permission from the authorities to build an urgently needed extension. Permission was withheld because of the marshy site, the authorities being afraid that dangerous vibrations would be set up, as trouble had already been experienced in Banjermassin from the engines working in the existing station.

As a result there were only two possible solutions to the difficulty, i.e., (1) to erect the additional plant at a considerable distance from the present station, or (2) to install it on a pontoon. The first alternative was rejected because of the difficulties and the high costs involved due to the distance



from the principal consumers and the existing station, and after a thorough investigation the pontoon proposal was agreed upon.

It was necessary that the new set should run absolutely free from vibration, a condition fulfilled by the choice of a six-cylinder four-cycle Diesel engine with no free outer forces or moments. The engine works with direct injection of fuel and develops 600 b.h.p. at 250 r.p.m. For the erection of the engine on the pontoon a modified bedplate had to be designed. It is connected by strong tie rods to the box frame, which is totally enclosed and fitted with oiltight doors. The cylinders, erected separately on the frame, have special cast-iron liners free to expand downwards, and are water cooled, but the trunk pistons are uncooled. The camshaft, driven from the crankshaft through spur gearing, is located in a trough cast on the frame, to which camshaft-driven fuel pumps are fitted. The plungers are ground into their cylinders, and fuel delivery is regulated from a ball governor by means of the pump valves. The speed of the engine can be varied by 5 per cent. by adjusting the length of one of the governor rods. The pump pressure lifts the spring-loaded fuel valves, and finely atomised fuel is injected into the combustion chamber through holes in the nozzle plate.

A gearwheel pump, driven from the main shaft, draws the lubricating oil through a filter from the sump in the bedplate and forces it, at a pressure of 7 to 14 lb. per sq. in., through an oil cooler into the oil piping leading to the crankshaft, gudgeon pins, and governor shaft. Lubrication of the cylinders is provided by a pump driven from the governor shaft. For cooling the cylinders under atmospheric pressure, a water tank has been erected on the engine-house roof; it is filled by a centrifugal pump driven from the shaft of the engine, running at 2,050 r.p.m., and delivering 60 gall. per min. An electrically driven pump of the same size is provided as standby.

Fuel is stored in two bunkers under the deck and is raised into the daily service tank in the engine house by a hand-pump. From the daily service tank, the fuel flows under gravity into the tanks, which are fitted with float valves, and from them to the fuel pumps.

The pontoon, which was built in Soerabaya, is 82 feet long and 26 feet wide, with sides 5 feet high and a draught of 5 feet. The deck is rectangular, and the bottom of the vessel is raised at the bow and stern to facilitate towing. The side walls have a slight slope. The pontoon is of the usual frame construction with two continuous side keels. Inside the engine room, in the direction of the axis of the Diesel set, the side keels are constructed as longitudinal bulkheads reaching up to the level of the engine-house floor. In addition, between these bulkheads there are another two constructed as foundation for the engine. The engine-house floor, which lies deeper than the pontoon deck, is laid with removable chequer plates, while the pontoon otherwise has an ordinary steel deck. On the deck of the pontoon, double bollards are fitted at the bow and stern, two at each end, for mooring the vessel to land and for fixing the tow ropes.

The engine house is also constructed of steel. In the lower part it is 18½ feet broad, so that there is a free passage on both sides on deck. The upper part of the engine room is narrower; it has four openings on each side and one opening at the end to admit air for the engine. A skylight is fitted above the engine.

For transmitting the energy generated, cables supported by floats lead from the pontoon to the switchgear in the main power house on land, so that one mechanic is sufficient for attendance on board.

A particular advantage of such a floating power station is the possibility of using it for assisting power stations on land not far from water at many different places or where the future development of power requirements is uncertain and would therefore make the construction of a permanent power station on land a speculative project. Such a plant is especially suitable for supplying energy for work in connection with the regulation of rivers in the thinly populated districts of Borneo, New Guinea, and neighbouring islands, since the work can be carried out at once without transmission lines having to be erected over long distances. When opening up fresh areas to cultivation—work usually started from the rivers—such a mobile source of power makes it possible to introduce machinery immediately and thus accelerate the work of opening up the territory.

Already the mobility of this station has been made use of: just after its completion and before being taken to Banjermassin, it was put to work in Semarang for a time.

Banquet to Colonel Crompton

ADVANTAGE was taken of the presence in London of many distinguished scientists, both British and foreign, to hold a banquet in honour of Col. R. E. B. Crompton, C.B., R.E., Faraday Medallist. The function took place at the Savoy Hotel under the chairmanship of Mr. Frank Parkinson.

Among the visitors from overseas were Dr. M. E. Brylinski, Senatore Principé Ginori Conti, Dr. Axel F. Enström, Prof. C. Feldmann, Prof. A. E. Kennelly, Dr. Vladimir List, Prof. L. Lombardi, the Marchese Marconi, G.C.V.O., and Prof. Elihu Thomson. British guests included Sir John Brooke, C.B., Sir Andrew Duncan, M.A., LL.B., Lt.-Col. Kenelm Edgcumbe, Mr. C. le Maistre, C.B.E., F.C.G.I., and Sir Archibald Page.

In proposing the health of Col. Crompton, the chairman referred to him as the G.O.M. of the electrical industry, and Prof. Lombardi, seconding, dwelt on the invaluable work done by Col. Crompton for the International Electrotechnical Commission, mentioning that he had never missed a meeting since its formation.

Col. Crompton, in response, drew upon recollections of his association with Queen Victoria, Sir Wm. Siemens, Elihu Thomson, Gramme, Sir Joseph Swan, Willans, and other people of eminence in many spheres in all lands whom he had met subsequently to his early thwarted attempts to mechanise the Indian army. He said that he hoped to be remembered by his work for the I.E.C. more than for any one thing in his life. He had always had loyal friends whose team work had made their efforts successful.

The toast of "Our Overseas Guests" was proposed by Sir John Brooke, C.B. (Vice-chairman, Electricity Commission), who referred in appropriate terms to the international work and reputation of the eminent Continental and American visitors present that evening. Replies were made by Dr. Axel F. Enström (president, International Electrotechnical Commission), the Marchese Marconi, G.C.V.O., LL.D., D.Sc., and Dr. List (Czecho-Slovakia), who all emphasised the esteem in which Col. Crompton was held abroad.

"The British Electrical Industry" was proposed by Prof. Kennelly (Harvard University) and responded to by Lt.-Col. Kenelm Edgcumbe. The last toast, that of the chairman, was put to the assembly by Mr. Harold Vernon.

Col. Crompton honoured: (Left) Monsieur E. Brylinski, Sir Archibald Page and Prof. C. Feldmann; (Centre) Prof. A. E. Kennelly, Mr. J. W. Meares, Mrs. Meares, Col. Crompton, Miss Crompton and Mr. C. Crompton; (Right) Col. Crompton, Mr. F. Parkinson and the Marchese Marconi.

Empire Radio Research

MR. R. A. Watson Watt and Mr. O. F. Brown, of the Department of Scientific and Industrial Research, gave an account of radio research in the Empire to Section A (Mathematical and Physical Science) of the British Association last week. The paper indicated the scope of the work being undertaken under the auspices of the Radio Research Board in Great Britain and of its direct counterparts in the Dominions. While the Board was concerned with the natural and uncontrollable phenomena of the media of propagation, rather than with the artificially controllable phenomena of terminal apparatus, there was one exception to this generalisation. It had been found expedient for the Board to assume responsibility for the work at the National Physical Laboratory on the development of radio-frequency standards and on the improvement of methods of precision measurement at high frequencies.

DR. H. M. TORY, president of the National Research Board of Canada, hoped to start active operations during the coming winter. The whole of the programme now being prepared would be submitted to the British Radio Research Board to ensure complete harmony of working between the two organisations.

During the course of a discussion on "Magnetic Storms and Ionisation in the Upper Atmosphere," Prof. E. V. APPLETON, F.R.S., said that two principal regions in the upper atmosphere were responsible for the reflection of wireless waves. The diurnal and seasonal variation of ionisation in the lower one (the Kennelly-Heaviside layer) had been studied in some detail during the past year. The maximum noon ionisation was six or seven times that at midnight, while summer noon ionisation was two and a half times that at winter noon. The corresponding relations for the upper region, the ionisation content of which was greater, had not yet been determined in such detail, but it was believed that the diurnal and seasonal variations were not so large. During periods of magnetic activity the principal change from normality was in the lower region, where the ionisation was usually increased. A common occurrence was for the ionisation to be increased two or three times. The theory of Maris and Hulbert (based on the experiments of Hafstead and Tuve) that the height of the ionised layer was very much increased during a magnetic storm was not acceptable.

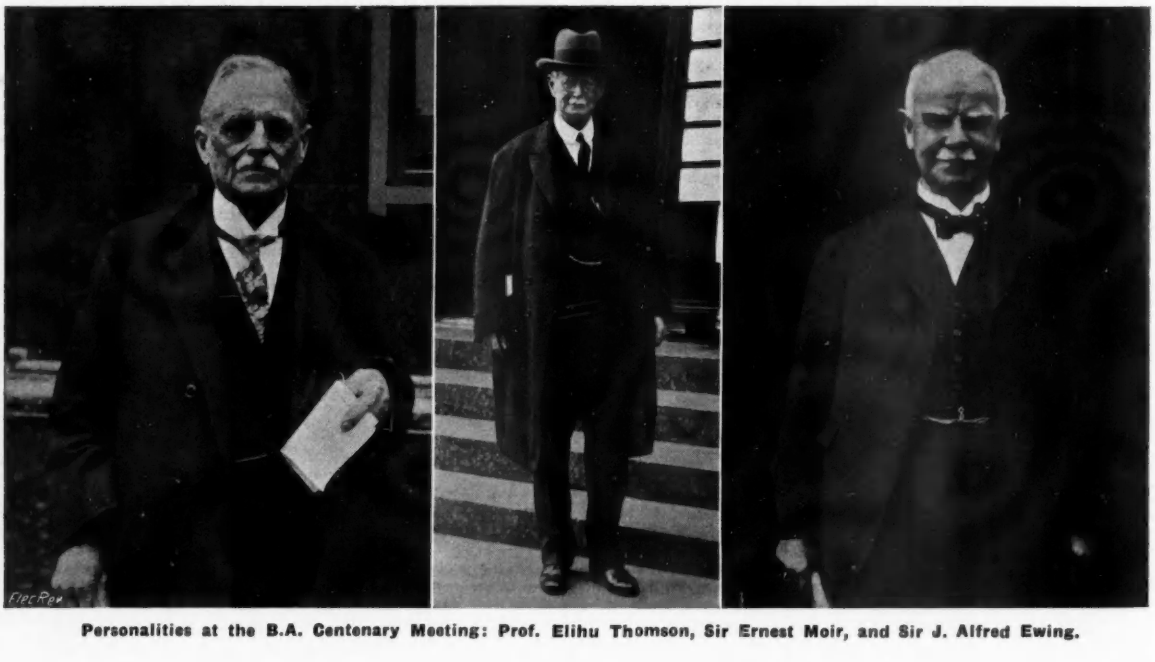
MR. A. H. R. GOLDIE pointed out that the electric field during magnetic storms as deduced from computations of the position, direction, and strength of electric currents capable of producing the magnetic displacements recorded at observatories appeared in the northern hemisphere to indicate that the region in which visible aurora was most frequent must be also the region of dissipation of positive electric current; that was, unless (following the Birkeland-Stormer theory) it could be regarded as a region of origin of negative electric current coming from the sun and injected at that point. The author was inclined to the view that the electric current, being mainly transverse to the magnetic field, was almost wholly a flow of positive ions, and that the electric field, both on quiet and on disturbed days, was generated on the sunlit side of the globe and mainly in tropical and sub-tropical regions; and that the difference between quiet and disturbed days arose from the effect of the sun in controlling the conductivity of the higher atmosphere over the daytime region. Calculation suggested that forces of electrical origin might play a considerable part in modifying, or controlling, the movement of the atmosphere at great heights, at least in the auroral zones.

The Industrial Application of Ideas

A CONTRIBUTION of considerable interest presented to the Department of Industrial Co-operation of the Economic Science and Statistics Section of the British Association was on "Bridging the Gap Between the Birth of an Idea and its Industrial Application," by Mr. A. P. M. Fleming, C.B.E., manager of the Research and Education Department of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. Fleming said that to increase employment it was necessary to give attention to every means whereby new ideas and knowledge could be translated into new industrial activity, and to expedite the various stages by which this could be accomplished. The conversion of a new idea into manufacturing activity involved, in general, a certain sequence of operations. First, fundamental research; the next stage was industrial research to test the possibilities of practical application and the economic value of the idea in comparison with any competitive products which it was designed to replace. The third stage was semi-scale manufacture to enable all difficulties likely to be encountered in full-scale manufacture to be overcome. The next stage was the selection and training of workers to undertake commercial production and, contemporary with this, the problem of finance required to establish production and marketing facilities. The last stage was the design and installation of the requisite productive facilities and the building up of the manufacturing organisation.

Progressive industrial firms had established research organisations with facilities for bringing about such new manufacturing developments as the individual concerns might decide to embark upon, but many organisations did not possess such resources. Moreover, the research organisations of the large concerns often produced by-products which did not fall within their manufacturing sphere. Similarly, there were many possible products, the development of which would be in the national interest, which the unaided manufacturer could not carry through the stages of research and semi-scale development. These conditions suggested the need for some organisation which was not yet available nationally, which could carry through the whole sequence of operations indicated and thus successfully "bridge the gap." A national organisation could embark upon a much wider programme of development, including not merely those which from the outset offered attractions of considerable financial return, but also those which might yield only such a return as would, in a national sense, balance the cost of unemployment and thereby help to retain the asset of the workers' ability, which in the case of the unemployed depreciated at a very rapid rate. Such an organisation would require to be operated with complete freedom from Government control and with the same mobility and type of administration that was found in a limited liability company. This freedom would not be practicable to a Government financed scheme. It could be accomplished by a patriot possessing the same public-spirited attitude that prompted the Mellon brothers to establish the Mellon Institute in Pittsburgh, U.S.A., or conceivably by co-operative arrangement with one or more of the research organisations of individual companies in different industries.



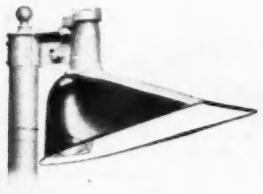
Personalities at the B.A. Centenary Meeting: Prof. Elihu Thomson, Sir Ernest Moir, and Sir J. Alfred Ewing.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Floodlighting Unit

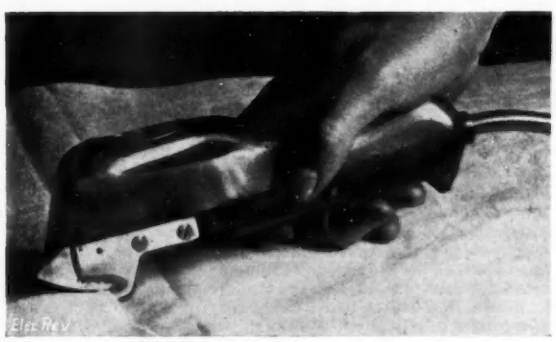
Benjamin Electric, Ltd., Brantwood Works, Tariff Road, N.17, are responsible for a new floodlighting unit, the "Duoflux," which has been put on the market. It consists of two entirely distinct reflectors, one a massive "Crysteel" diffuser which serves as a powerful and extensive floodlight, and the other a special highly polished metal reflector which produces a beam of concentrated light to the order of 25,000 foot-candles centring attention on the object or area to be emphasised. Since it is intended for open-air use almost exclusively, the fixture is designed to offer the greatest possible resistance to weather and atmospheric conditions. The head and the bracket are of heavy cast-aluminium, while the porcelain-enamel finish of the diffusing reflector resists deterioration from smoke, dirt, and bad weather. The reflector surfaces never require paint or refinishing, but an occasional rub with the Benjamin "Reflector Cleaner" will keep them at their maximum efficiency. The reflector is capable of what amounts to universal adjustment, in that it may be tilted to a point 30 deg. below the horizontal. The focusing of the concentrating beam can be instantly adjusted, and the complete unit can be swivelled around its supporting pole and locked in any required position. The wiring is totally enclosed.



"Duoflux" Floodlighting Projector

Electro-magnetic Shears

Joseph Rodgers & Sons, Ltd., Sheffield, have just acquired the sole manufacturing rights for what they term an electric shear, and although they are not yet actually manufacturing it, they have made arrangements for supplies to be available before they are fully working. The tool is made in several models, the smallest and most popular one being for cutting single thicknesses of material, from the flimsiest to ordinary tailor's cloth. A modification of this model is also developed to cut sponges, rubber and light materials. Another pattern is for cutting all materials in multiple layers, and a further model is for an even larger number of layers, thin paste-board, felt, leather and such-like materials. It is not claimed that this shear eliminates the use of existing cutting devices for very great thicknesses and numbers of layers of material, but that it is an adjunct to such larger and higher-priced cutting machines. The machine operates on a.c. at 220 V. with 10 per cent. variation, and the consumption is practically negligible. For working on d.c. a small convertor can be supplied.



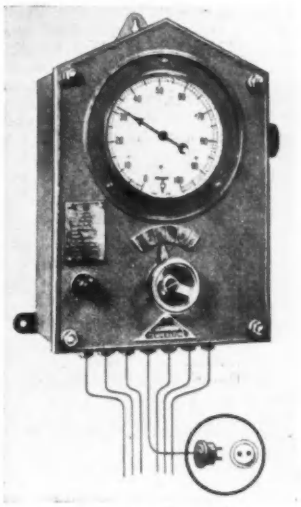
Rodgers's Electric Shear

Self-tapping Screws for Sheet Metal

The Parker-Kalon Corporation of New York, U.S.A., has developed two new types of hardened screws which appear to have some outstanding advantages for making fastenings to sheet-metal and for other assembly work. They are not driven in with a hammer, but are turned into position with a screwdriver, cutting their own thread as they penetrate the metal. The threads are somewhat like those of the ordinary wood screw, and they enable the screws to be driven into metal such as brass, steel, iron, aluminium and die castings, etc. The screws are claimed to be ideal for making fastenings to switchboards and other equipment made from slate, ebony, asbestos, bakelite, etc. The A type screw is tapered, and is intended for joining light gauges of sheet metal, and also metal to wood, while the Z type is parallel and suitable for material of heavier gauges. The distributors of the screws in this country are Buck & Hickman, Ltd., Whitechapel Road, London, E.1.

A Mains Electrical Thermometer

The "All Mains" electrical thermometer recently introduced by Negretti & Zambra is constructed to operate direct off a normal electricity supply circuit. It is constructed on the "Wheatstone Bridge" principle with the fourth arm of the bridge arranged in the form of a thermometer bulb wound with nickel or platinum wire, which changes its electrical resistance with changes of temperature. This change of resistance alters the balance of the electrical circuit and deflects the galvanometer from the zero position. The circuit is restored to balance by adjusting a variable slide wire until the galvanometer returns to zero. The galvanometer is only used for balancing the circuit and indicating zero, and it is not calibrated with the temperature scale as is usual. The temperature scale consists of a circular slide-wire resistance connected direct to a pointer, and is adjusted by the knob at the side of the case. The accuracy of the reading does not depend on the calibration of the galvanometer. The instrument can be supplied to operate off a.c. or d.c. mains, and the a.c. models are fitted with Westinghouse metal rectifiers. Special precautions regarding the insulation of the bulb system are necessary when operating off high-voltage d.c. mains. The instrument is mounted in a cast-iron moisture-proof case, heavily enamelled and stoved grey, with lugs for wall attachment, a dial 6 in. in diameter graduated as required, and rotary switchgear mounted in a case with a terminal panel and cable resistances. The lead-in cables at the bottom pass through water-tight cable glands. The instrument is suitable for dealing with temperatures up to 1,000 deg. F.



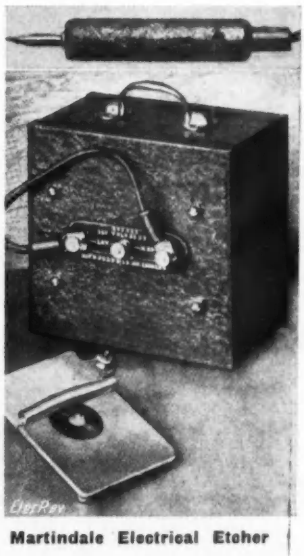
"Negretti" All-mains Thermometer

A Vacuum Cleaner

An interesting newcomer in the field of domestic cleaning apparatus is the Westinghouse vacuum cleaner, handled in this country by J. Dyson & Co., Ltd., 5 and 7, Godwin Street, Bradford. While conforming to the design readily acceptable to housewives, it incorporates several distinctive features, all of which have a decided bearing on efficient action and easy handling. The sturdily built motor is of the universal type, while the fan is specially balanced for smooth and silent running. The dust bag is of fabric specially treated to retain fine dust, whilst a trap is incorporated at the point of entry to retain the contents when the bag is removed for emptying. The cleaner is supplied in three models, one with a stationary brush cleaner, incorporating a "super-suction nozzle," another with a motor-driven brush cleaner, and a very light all insulated and perfectly balanced single-hand cleaner.

An Etching Tool

Displayed at the recently held Shipping, Engineering and Machinery Exhibition at Olympia, London, was a new electrical etching tool for marking gauges, dies, gears and other articles of iron and steel, an introduction of the Martindale Electrical Co., Ltd., The Hyde, Hendon, N.W.9. This little set comprises a transformer with three tappings, an earthing cable, a clamp for large pieces, and a contact plate for small parts, together with a handpiece with two writing points which, used like a pencil, burn the desired marking in the metal, leaving a clear and permanent record.

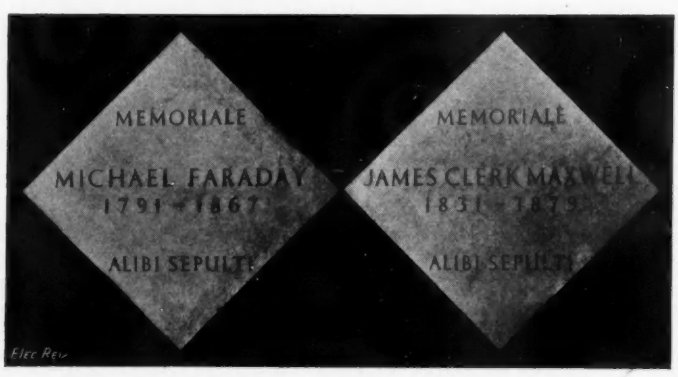


Martindale Electrical Etcher

The Maxwell Centenary

Proceedings at Cambridge Celebrations and Westminster Abbey Tablet Unveiling

THE celebration of the centenary of the birth of James Clerk Maxwell is taking place at Cambridge this week. About ninety delegates have been nominated by the principal academies and learned societies of the world and by the home universities. Amongst the delegates are: Profs. Kennelly and Millikan, from the United States; Profs. Cotton and Brillouin, from France; Prof. Max Planck, Prof. Debye, Prof. Bohr, Prof. Siegbahn, the Marchese Marconi, General Smuts, Prof. Zeeman, and Prof. Nagaoka. The University of Cambridge also invited a number of guests and welcomed at the celebration many of those who worked in the Cavendish Laboratory in its first years under Maxwell—Dr. William Garnett, Sir Ambrose Fleming, Sir Richard Glazebrook, Sir Napier Shaw, Sir Arthur Schuster, Prof. W. M. Hicks, and others. Prior to the Cambridge proceedings many of the delegates attended the unveiling of memorial tablets to Faraday and Maxwell in Westminster Abbey. The Royal Institution and the University of Cambridge obtained the permission of the Dean and Chapter for the placing of these memorials, with the Kelvin tablet, in close proximity to the Newton tomb. The Master of Trinity, Sir J. J. Thomson, unveiled the tablets, which we illustrate, on September 30th.



Memorial Tablets to Faraday and Clerk Maxwell

The official proceedings in Cambridge commenced with the Vice-Chancellor's luncheon in Corpus Christi College yesterday (October 1st), after which a procession was formed to the Senate House, where the Chancellor welcomed delegates and received addresses. The Master of Trinity then delivered the memorial lecture; after an "At Home" in Peterhouse, Maxwell's first home in Cambridge, in the evening a reception was held in St. John's College. This morning addresses will be given in the Arts School by Prof. Max Planck, Sir Joseph Larmor, and Prof. Niels Bohr. This afternoon an address will be given in the Cavendish Laboratory by Sir James Jeans, also short addresses by contemporaries of Maxwell: Dr. Garnett, Sir Ambrose Fleming, and Sir Oliver Lodge. An exhibition of Maxwell apparatus and manuscripts is being organised, and visitors will have an opportunity of seeing the work of the laboratory. The proceedings will be closed by a banquet given by Trinity College. The addresses given at the celebration, together with a contribution by Prof. A. Einstein, are to be published by the University Press in a commemorative volume.

The actual centenary date was June 13th last. The career and achievement of the master mathematician were referred to in our issue of June 12th, 1931, page 990.

The E.P.E.A. Dinner

THE thirteenth annual dinner of the Southern Division of the Electrical Power Engineers Association to the members of the National Executive Council, was held last Saturday, at the King's Hall, Holborn Restaurant, London. This function is always most enjoyable, and is invested with just the right family party spirit. This year, for the first time, the dinner was followed by a dance, an arrangement that not only the ladies regarded as a pleasing departure from precedent.

After Mr. C. Cooper (chairman) had welcomed the guests, who included many of the foremost men of the profession, the toast of "The Association" was proposed by Ald. W. Walker, who stated that the N.J.B. would be opposed to any suggestion of "cuts" in the salaries of the technical staffs, as under the "Schedule" they had already suffered reductions, and it would therefore be grossly unfair to bring them into any general scheme of reduction. Discussing the relations of the electricity and gas industries, he said that there was a sphere for each—where the dividing line came would be decided when it was known whether there was anything electricity could not do.

Mr. A. E. Ricketts, B.Sc. (president, E.P.E.A.), said that there would inevitably be many men affected by the reorganisation of generation, but the Displacement Committee would see that as far as was humanly possible the experience of any of these men would not be lost to the industry. The Association through, among other things, its National Technical Groups and its new correspondence tuition, was doing everything it could to keep its members abreast of the times.

Capt. J. M. Donaldson, M.C. (president-elect, I.E.E.), proposing "The Electricity Supply Industry," approved rationalisation so long as it meant the doing of more work with the same number of men and not merely the same amount with less men. He had faith in the ability of station engineers to adapt themselves to distribution work. Sir Andrew Duncan, M.A., LL.D. (chairman, Central Electricity Board), briefly responded. He asked the industry to regard the C.E.B. as a co-operative effort, and suggested that discoveries provided a new avenue for human effort and that a man's destiny lay very largely in his own hands.

Presentations were then made by Mr. D. S. Duffy (senior vice-president) to Mr. A. V. Sendall (past-president), of a radiogram, and to Mrs. and Miss Sendall of gold wrist watches. Mr. Sendall briefly replied to the effect that his spare time was always at the disposal of the Association.

The chairman then thanked Mr. F. H. Smethurst for his work in organising so successful a function, which was worthy of the high standard set up by his predecessor, Mr. P. Gordon Hieatt. Mr. Smethurst suitably responded.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The B.E.A.M.A. Index

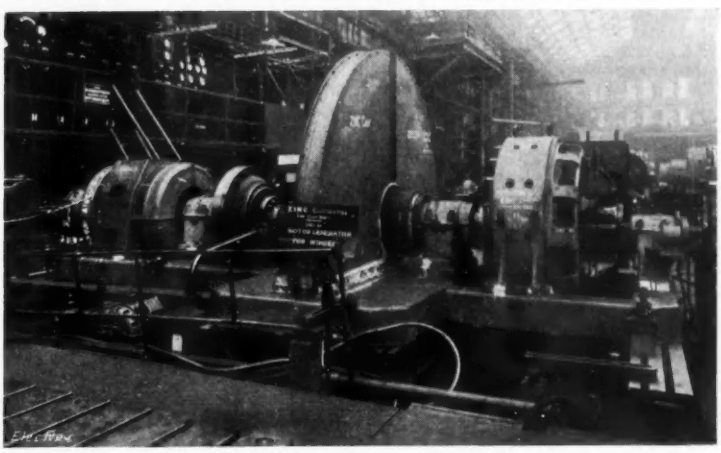
A considerable decline in electrical manufacturing is indicated by the B.E.A.M.A. Index of Activity for August. With 1924 as a basis (100) the figure for last month was only 72.6 as compared with 84.1 in July and 114.6 in August, 1930. At the same time the index of electricity production fell from 155 per cent. of the 1924 level to 149 per cent.; the August, 1930, figure was 142 per cent.

Mining Engineers at the Met.-Vick. Works

The Institution of Mining Engineers paid a visit on September 24th, during their summer meeting, to the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd. They arrived in the early afternoon, having spent the morning at Barton power station, and were received by Sir Philip Nash, chairman of the company. After inspecting the large high-voltage switchgear in course of construction the party proceeded to the staff canteen for lunch. After lunch the visitors were divided into parties, the various groups taking different routes round the works in the course of which they were shown the high-voltage laboratory where a display of high-voltage discharge phenomena had been arranged for them, the tank shop where different processes of electric welding were being used, the foundry, the transformer shop, and the main machine shop. In the last they were shown, running on the test bed, a 500-kW motor generator set for supplying a winder at one of the Zinc Corporation lead mines. In course of erection was a similar but larger flywheel motor generator for driving a winding motor at the Broken Hill Mines. Large turbo-generator sets up to 64,000 kW in various stages of completion were also inspected. A special display of the company's apparatus produced exclusively for mining work was set up at one of the crossings. This display included a governor control mechanism for braking which has recently been put on the market by the company and which provides for a definite deceleration of the winding drum under all conditions of load, brake adjustment, &c., assembled and disassembled. A large-size liquid controller with sector shaped tanks was shown opened up and with the servo-motor for operating it by its side. There was also on view a self-contained geared turbo-generator set complete. The north gallery of the main shop contained examples of flameproof switch and control gear manufactured by the company specially for use in mines. There was also an exhibition of Cosmos lamps which included bulbs for miners' lamps. A set of control gear for an electric train was also shown in operation.

The I.E.E. at Henley's

The visit of members of the Institution of Electrical Engineers to the works of W. T. Henley's Telegraph Works Co., Ltd., Gravesend, on September 24th, was organised by Mr. R. O. Wright, M.I.E.E., the works manager, and Mr. E. E. Judge, A.M.I.E.E., the assistant works manager. The party—numbering eighty, including ladies—travelled down from Victoria Embankment by motor coaches and was met at the works by Sir George Sutton, Bart., the chairman, and Messrs. Rosling, Bishop, and Dunsheath, of the management staff from the company's head office. A circuit of the works was made in ten small groups, each under the guidance of an expert member of the staff, who explained the processes of manufacture in the various departments. At a luncheon which followed in a marquee on the lawn on the river front, Sir George Sutton presided. In the course of a brief speech he said, among other things, that Henley manufacturing went back to 1837, only six years after Faraday's great discovery. He had no evidence that Henley ever met Faraday, but he thought he must have done, because it was certain that Henley worked for Wheatstone. Mr. J. R. Beard voiced the thanks of the visitors to Henley's board, staff, and workpeople for their kindness, and Mr. Percy Rosling, the general manager, responded on behalf of the company. Each guest was presented with a very fine souvenir booklet and other reminders of the occasion. The party then left in the motor coaches to visit the Central Electricity Board's sub-station at Swanscombe, a description of which appears on page 498 of this issue.



A View of the Trafford Park Works

Electrical Publicity at Manchester

The Manchester Corporation Electricity Department has recently produced a series of five posters which it is displaying on the sides of its vans, sub-station buildings, and other prominent sites. Two of the posters, which are in particularly striking colours, relate to assisted wiring and electricity generally, while the remainder deal pictorially with the Department's hire and hire-purchase terms for wash-boilers, water-heaters, and a.c. motors.

The Business Research and Management Association's Programme

The Business Research and Management Association of Great Britain has prepared its programme for the 1931-32 session, when the following papers will be read:—October 6th: "Industrial Research," by Dr. Elton Mayo. November 3rd: "Research in Wholesale Distribution," by Mr. W. A. Cooke. December 10th: "Financial Accounts in Management Control," by Mr. B. Biddle. January 12th: "Market Research as an Aid to Management," by Mr. A. N. Coglan. February 3rd: "Increased Efficiency through Management Incentives," by Dr. G. H. Miles. March 8th: "Research as a Factor in Personal Management," by Dr. C. H. Northcott. April 5th: "Research in Retail Distribution," by Mr. F. Chitham. May 11th: "Education for Management," by Prof. P. Sargant Florence. All the meetings will be held at Anderton's Hotel, Fleet Street, E.C.

The I.E.E. Party at Henley's Gravesend Works

A Mavor & Coulson Exhibit

At the exhibition of the Coal Face Machinery Exhibitors' Association, which opens in Sheffield to-day (Friday), Messrs. Mavor & Coulson, Ltd., are exhibiting a comprehensive display of their mining machinery. In the centre of their stand are four representative types of coal-cutters, while other exhibits include conveyors, loaders, switchgear, and equipment for mechanical loading on longwall faces.

The " Standard " Fire Brigade

The private fire brigade of the Woolwich factory of Standard Telephones & Cables, Ltd., has had a successful season in open competitions this year. Following upon its success in tying for first place in the City of London's private fire brigade competition last May, it won the Nestlé cup for the private fire brigade championship of the United Kingdom at Hammersmith on September 26th, besides winning the Achille Serre cup for five-men drill and the Hitchcock shield for two-men drill. The Herbert cup for one-man drill was won by the same company's Hendon factory fire brigade, the Woolwich brigade being third.

Canadian Radio Trade

The sales of radio receiving sets in Canada during 1930 amounted to 223,228 units, valued at $22,776,225 at factory selling prices. Of this total 170,082 sets, valued at $19,196,936, were completely manufactured or assembled in Canada, while the inventory at the end of the year was reported at 25,852 sets. The number of radio receiving licences issued by the Dominion Government advanced in 1930 to a total of 559,116, an increase of 43 per cent. as compared with the total issued during 1929.

The Russian Electrical Industry

According to the *British Russian Gazette and Trade Outlook*, the production of the united electrical industry in Russia during the first half of the current year showed an increase of 48 per cent. as compared with the corresponding period of 1930. The production of the boiler and turbine industry also rose during the same period by 43.2 per cent.

An American Radio Factory in England?

It is reported that the Zenith Radio Corporation of Chicago has decided to open a factory in this country for the manufacture of radio receivers. A site of 6,000 sq. ft. has already been acquired near London, and it is expected that the factory will be in operation at the end of the current year. British labour will be employed, and negotiations are in progress with British manufacturers for the making of the valves and cabinets for the sets. The company has stated that by the end of the current radio season it will be giving employment to about 2,000 people.

The London J.E.A. Exhibit at Surbiton

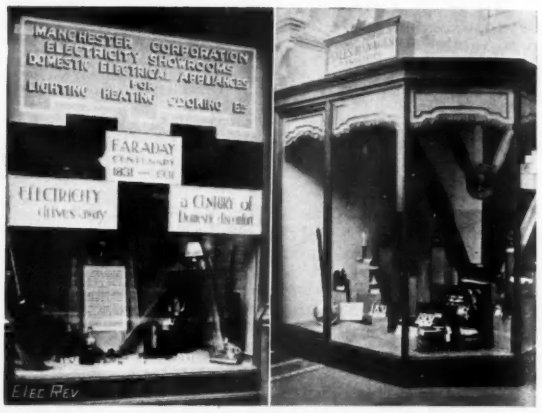
Considerable activity has been shown in the field of domestic electrification during the few months since the London Joint Electricity Authority took over the electricity supply in the Surbiton district, and last week the Authority was a prominent exhibitor at a Modern Homes Exhibition, held at the Surbiton Assembly Rooms. This is the first time the Authority has exhibited in Surbiton, and the occasion was, therefore,

A portion of the London J.E.A.'s Exhibit

one of particular interest. The largest portion of the exhibit was devoted to an electric kitchen (shown above), where continuous demonstrations were given of cooker, water heaters, irons, vacuum cleaners, clothes- and dish-washing machines. In addition, there was a display of some of the latest types of fires, kettles, hair-dryers, shaving mugs, and other labour-saving devices, while in a corner of the stand were shown typical bathroom appliances. For proprietors and designers of shop premises a special exhibit was arranged to demonstrate correct and incorrect methods of shop-window lighting.

Faraday Celebrations at Manchester

During the recent Faraday celebrations in Manchester, the Corporation Electricity Department arranged special displays at the electricity showrooms and at the Sales Manager's Department at the Town Hall. As will be seen from the accompanying illustrations, domestic appliances in use in 1831 were shown



Manchester Electricity Department's Displays

together with modern electrical appliances, effectively demonstrating the enormous strides which have been made in domestic comfort by the introduction of electricity into the home.

The Levant Fair

The Department of Overseas Trade has been notified that the fifth Palestine and Near East Exhibition and Fair will be held at Tel-Aviv from April 7th to 30th, 1932. The organisers have expressed the intention to inaugurate a " Buy British Goods " campaign, and, provided a sufficient number of British firms participate, it is intended to house such exhibits in a special British pavilion. It is considered that the display of agricultural machinery, pumps and other irrigation plant, electrical goods, wireless apparatus, etc., should lead to good results. Particulars regarding the charges for space, together with a copy of the rules and regulations of the exhibition, are in the possession of the Department, and are available for loan, in order of application, to bonâ fide British firms.

Leeds Electrical Club

The third annual meeting of the Leeds Electrical Club was held on September 21st, when the chairman, Mr. E. J. Arnold, remarked on the success of the club, and stated that for the past year it showed a profit of £121.

The club is holding a dinner dance at the Hotel Metropole, Leeds, on November 6th, at 7.30 p.m. Tickets, at 8s. 6d. each, can be obtained from Mr. E. G. Sellers, 15, Wellington Street, Leeds, or from members of the Committee.

The Japanese Electrical Industry

According to our Yokohama correspondent, statistics for 1929 show that water turbines manufactured in Japan have now almost replaced foreign products, the value of those made in the country amounting to 2,031,000 yen. Although steam turbines of large capacities are imported, the smaller types of machines are mostly home-produced. Large Diesel engines continue to be imported, the value of internal combustion engines manufactured in the country being 103,000 yen for gas engines, 512,000 yen for light-oil engines, 9,700,000 yen for medium-oil engines, and 7,480,000 yen for heavy-oil engines. During 1929 gas and oil engines to the value of 14,476,000 yen were imported. Imports of generators, transformers, etc., amounted in 1930 to 3,893,000 yen, while in 1929 the value of apparatus of Japanese manufacture was 7,907,000 yen for generators, 16,005,000 yen for motors, 1,710,000 yen for convertors, 12,330,000 yen for transformers, and 187,000 yen for rectifiers.

Italian Electrical Imports and Exports

A return just to hand shows that the imports of electrical machinery, apparatus, and supplies into Italy during the six months ended with June last attained a value of £1,425,890, as compared with £2,077,225 in the corresponding half of 1930. The exports during the same period also declined from £483,850 to £449,095.

Charge Against Canadian Association

Twenty-three individuals and firms, members of the Electrical Estimators' Association, were arraigned before Magistrate Jones, of Toronto, charged with conspiracy and breach of the Combines Investigation Act on September 17th. It was claimed by the prosecution that the Association prevented the presentation of tenders which it considered too low, and was an illegal organisation in restraint of trade.

Radio-apparatus Manufacture in Hungary

It is announced from Budapest that the German Siemens and Halske Co. is to erect a large works in that city for the manufacture of radio apparatus on the Telefunken system.

Traction Equipment Co-operation

Messrs. CROMPTON PARKINSON, LTD., and Messrs. ALLEN WEST & Co., LTD., announce that they have made arrangements to undertake the manufacture of electric traction equipment in co-operation. They state that they have secured the services of eminent traction engineers with long experience in the design and operation of traction motors and control gear, and will manufacture jointly the equipment required for tramcars, railless cars, railway motor coaches, and i.c.-electric vehicles. The motors will be made at the Chelmsford works of Crompton Parkinson, Ltd., where special manufacturing and testing plant is now being installed. Messrs. Allen West & Co., Ltd., will be responsible for the production of the control gear at their Brighton and Southampton works. Initial equipments are now in course of manufacture for a number of home tramway and railway systems, and will be in service shortly. All communications relating to this matter should be sent to Crompton Parkinson, Ltd., Traction Department, Chelmsford.

Franco German Electrical Co-operation

The report of the Société Générale de Constructions Electriques et Mécaniques (Als-Thom) mentions that the French manufacturers of heavy electrical machinery have entered into a long-term agreement with German competitors with regard to the regulation of the European market. This restriction of competition will prevent a falling-off in prices.

Victorian Electricity Commission's Operations

Answering questions concerning the financial operations of the State Electricity Commission, in the Victorian Legislative Assembly, Mr. Cain, Minister for Railways, said that he had been supplied with the detailed trading account and profit and loss account for the financial years 1929 and 1930 relating to the Commission's merchandising activities, and he was satisfied with the result. He was not, however, prepared to supply the information to the House. Explaining the cause of the decrease from £399,000 in 1927 to £100,000 in 1930 in revenue received by the Commission from the Melbourne Electric Supply Co.'s undertaking, Mr. Cain said that apart from the effect of the position of industry, the primary cause of the decrease was the decision of the Commission in 1927 to anticipate the transfer of the company's undertaking. In that year the company had been instructed to introduce Metropolitan standard tariffs, beginning with the domestic two-part tariff. In the three years the tariffs had cost the undertaking £431,000. The reduction had resulted in the average selling price per kWh being reduced to domestic consumers by nearly 30 per cent., and to commercial consumers by nearly 15 per cent. At the Commission's direction the company had also reduced the standard rates for all-night public lighting to municipalities on condition that the amount of the concession should be used to provide additional lighting. The average selling price of energy to municipalities had been reduced by nearly 50 per cent.

New Australian Company

A new company, having the title of "The Duhart Electrical Co., Ltd.," has been formed in New South Wales with a capital of £1,000 to manufacture and distribute "Duhart" electric torches and dry batteries. The secretary is Mr. A. H. Callaway, 133, Pitt Street, Sydney.

Breach of Electricity Regulations

For failing to protect adequately an electric conductor, the Chemical & Metallurgical Corporation, Ltd., of Astmore, Runcorn, was recently fined £10 at Runcorn. The prosecution was taken as the result of an accident at the works.

Trade Announcements

Messrs. ELTON, LEVY & Co., LTD., have moved to 18, St. Thomas Street, London Bridge, S.E.1. The telephone number is Hop 2825-6, and the telegraphic address, "Effenleco, Boroh, London."

Messrs. BELLING & Co. have recently opened new London showrooms at 313, Regent Street, W.1.

MR. E. R. MORRIS, electrical contractor, of Chesterfield, has removed his business from Knifesmithgate to premises in Irongate.

The WHITWORTH ELECTRIC LAMP Co., LTD., has opened a branch at 1, Back of the Walls, Bernard Street, Southampton, where large stocks of lamps, radio material, conduits, and wiring accessories will be held.

Messrs. SWAIN & HUMPHREYS have commenced business in Wesley Street, Newtown, Mont, as electrical and radio engineers.

The BERGMANN ELECTRIC Co., LTD., states that its offices and stores are now combined at 1-3, Brixton Road, S.W.9. The telephone number is Reliance 2684/5, and the telegraphic address "Fulgura, Claproad, London."

MR. T. LAWTON, late of Lawton & Co., Ltd., has commenced business as an electrical engineer, at 14a, Prospect Hill, Douglas, Isle of Man.

SAVEWORK, LTD., Liverpool, informs us that it has given up its agency for electric washers which has been taken over by the DOWSING RADIANT HEAT Co., LTD.

Radio "Pool" to Protect Patents

In a statement made to the *Wireless & Gramophone Trader* the Radio Manufacturers' Association says that the licensing "pool" (Marconi Wireless Telegraph Co., Ltd., the Gramophone Co., Ltd., and Standard Telephones and Cables, Ltd.) has definitely decided to take sustained action against infringers of its patents, whether a manufacturer, a dealer or a user, and in prosecution of such policy writs have already been issued against certain dealers. Warning is issued that any guarantee of indemnity given to a dealer by a party outside the pool will not prevent the bringing of an action by the pool against such a dealer. Included in the valuable patents owned or controlled by the licensing pool are the following: A.c. mains eliminator, screened-grid circuit, super-heterodyne and "push-pull" patents.

New Catalogues and Lists

The INDICATOR ELECTRIC Co., 103 & 105, Moore Park Road, Fulham, S.W.6.—A showcard relating to the "Indicator" bell push.

MARCONI'S WIRELESS TELEGRAPH Co., LTD., Marconi House, Strand, W.C.2.—Leaflet No. 1,136, describing the "Marconi" short-wave direction finders types D.F.g.5a and D.F.g.6a.

FERRANTI, LTD., Hollinwood, Lancs.—Folders illustrating the company's new season's fires and water-heaters.

The SUN ELECTRICAL Co., LTD., 118 & 120, Charing Cross Road, W.C.2.—A 304-page lighting fittings catalogue (No. 602). The publication is profusely illustrated (partly in colour) and deals with fittings of every type and period.

VENRECO, LTD., 76, Neal Street, W.C.2.—An illustrated catalogue of stage-lighting equipment.

The GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2.—A novel radio station indicator and "Osram" valve chart (O.V. 5984).

The METROPOLITAN-VICKERS ELECTRICAL Co., LTD., Trafford Park, Manchester.—A collection of new and revised leaflets for insertion in the company's sectionalised catalogue.

The BRITISH HOME AND OFFICE TELEPHONE Co., LTD., 272-274, Vauxhall Bridge Road, Victoria, S.W.1.—A folder relating to business inter-communicating telephone installations.

M. W. WOODS, LTD., 46, Kingsway, W.C.2.—A folder referring to the company's fractional h.p. motors, polishing and grinding motors and exhaust fans.

RHODES, BRYDON & YOUATT, LTD., Waterloo, Engineering Works, Gorsey Mount Street, Stockport.—Publications 121 and 122, giving particulars and prices of the company's "Mopump" and "Mopump Minor."

ENA ELECTRICAL APPLIANCES, LTD., Church Road, N.1.—A leaflet illustrating the "Ena" electric fire.

The JACKSON ELECTRIC STOVE Co., LTD., 143, Sloane Street, S.W.1.—A calendar-blotter for October, featuring the new "Jackson" cooking cabinet.

BERKELEY & YOUNG, LTD., Tyseley, Birmingham.—Lists Nos. D.F. 7/31 and D/931, dealing respectively with "Bandy" electric fans, and "Davidson" domestic electrical appliances.

BELLING & Co., Bridge Works, Southbury Road, Enfield, Middlesex.—A 1931-32 season catalogue of fires, cookers, water-heaters, and other domestic electrical appliances.

L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, Kingsway, London, W.C.2.—Leaflets relating to "Eco-dry" cabinets, and "Peter the Heater," the automobile radiator heater. Also a catalogue of new "Magicoal" fires, with particulars of reduced prices.

BROWN BROTHERS, LTD., Brown's Buildings, Great Eastern Street, E.C.2.—A 92-page general catalogue (No. 332) of domestic electrical appliances, lighting fittings, electrical accessories, etc., together with a supplement (No. P203) on glassware.

DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, W.C.2.—A well-produced illustrated catalogue (No. 499) of lighting fittings. Also pamphlet (No. 497) giving a list, with prices, etc., of radio valves supplied by the company.

The IGRANIC ELECTRIC Co., LTD., 147, Queen Victoria Street, E.C.4.—An illustrated pamphlet (No. 6717) relating to the company's switch- and control-gear, motor starters, etc. Also a number of publications dealing with "Igranic" radio components.

H. W. SULLIVAN, LTD., Leo Street, S.E.15.—A booklet, giving full particulars of "Sullivan" electric fires and cookers for the new season.

The BRITISH THOMSON-HOUSTON Co., LTD., Rugby.—Illustrated leaflets describing induction motors, fractional h.p. motors, motor starters, generators, resistances, circuit-breakers, switchgear, transformers, etc.

E. K. COLE, LTD., "Ekco" Works, Southend-on-Sea.—Leaflets, illustrating and describing all-mains radio receivers, radio-gramophones, power units, and "Radio-corders."

Book Notices

A second edition has recently been published of the list of electrical equipment approved by the Hydro-Electric Power Commission of Ontario.

"The Electrical Contractors' Association of Scotland Year Book and Diary, 1931-32." (Pp. 132 and diary). Edinburgh: The Association. Price 3s. net. The latest edition of this annual follows very much on the lines of preceding editions. It includes portraits of the president (Mr. Henry Meighan) and

other officers of the Association. A new feature is an article on the British Electrical Development Association summarising the Association's activities in the Scottish area during the past year. All the usual features are retained, and the various sections have been brought up to date.

"Fractional Horse-power Motors," by A. H. Avery. Pp. vii+152; figs. 47. London: Sir Isaac Pitman & Sons, Ltd. Price, 7s. 6d. net.

"Mathematics for Self-Study," by J. E. Thompson. Four volumes. London: George Routledge & Sons. Price 7s. 6d. each volume.

Recent Contracts

Messrs. DAVEY, PAXMAN & Co., LTD., have recently received several important orders for Diesel engines. The Bank of England, for whom Dr. Oscar Faber is consultant, has ordered through its contractors, Messrs. Drake & Gorham, Ltd., four "Paxman" totally-enclosed heavy-duty oil engines. Each engine has eight cylinders, capable of developing 450 b.h.p. at 650 r.p.m., and will be direct-coupled to a 300-kW d.c. generator. Orders for heavy-duty oil engines have also been received from the Tenby Gas Consumers' Co., and the Enniskillen Electric Light & Power Co., Ltd., and, in addition, the company has recently supplied a number of direct-propulsion sets to the Egyptian Government.

For Sale

Generating plant and electric vehicles are offered for sale by Merton and Morden Urban District Council.

(See our advertisement pages to-day.)

Bankruptcy Proceedings

R. H. Chambers (R. H. Chambers & Co.), electrical engineer, Market Street, Dartford.—Receiving order made September 22nd on debtor's own petition. First meeting October 2nd at the Official Receiver's office, 280a, High Street, Rochester. Public examination October 19th at the Court House, Eastgate, Rochester.

J. L. Goldsman, radio engineer, 100, High Holborn, W.C.—First and final dividend of 3½d. in the £, payable October 13th at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.

A. C. E. Applin (Applin & Burt), electrical engineer, 110, St. Mary's Road, Southampton.—First and final dividend of 1s. 4¾d. in the £, payable October 9th at the Official Receiver's offices, Midland Bank Chambers, High Street, Southampton.

G. Clarke & C. W. Pullen (Northern Motor Sign Co.), electric sign specialists, 9, Oxford Street, Manchester.—First meeting held September 29th. Public examination December 4th at the Court House, Quay Street, Manchester.

Company Liquidations

Sphinx Electric, Ltd., Sphinx House, 47, Hatton Garden, E.C.—The accounts lodged under the compulsory liquidation of this company show liabilities of £12,887, against assets of £3,100, and a total deficiency of £132,411 as regards contributories, the issued capital being returned at £122,623. The Official Receiver, who is the liquidator, reports that the company was registered as a public company on January 29th, 1929, to acquire as a going concern and carry on the business of manufacturers of and dealers in electric lamps, fuses, and other electrical apparatus, then being carried on by Auto-Bulbs, Ltd., at the above address. On February 25th an agreement was entered into whereby the company was to pay Auto-Bulbs, Ltd., £88,000 for its assets, this sum to be satisfied by the payment of £47,000 in cash and £41,000 by the allotment to Auto-Bulbs, Ltd., of 770,000 ordinary shares of 1s. each and 10,000 preference shares of 5s. each. On February 26th, 1929, a prospectus was issued inviting the public to subscribe for 290,000 preference shares of 5s. each at par (£72,500) and 580,000 ordinary shares of 1s. each at par (£29,000). The sum of £81,624 was received in subscriptions for shares; of this amount £47,000 was paid to Auto-Bulbs, Ltd., and over £11,000 was absorbed by the costs of the promotion and formation of the company, etc., leaving a sum of approximately £23,000 available for working capital. From February 25th, 1929, the company traded in the various devices purchased from Auto-Bulbs, Ltd., and also obtained concessions for the sale of other electrical and automobile devices; in no single instance, however, did the company comply with the terms of the contracts, with the result that the concessions were either cancelled after a short period of working or not proceeded with. The trading accounts show a gross profit of £11,877, but a net loss of £16,167. The failure of the company is attributed by a director to (a) the fact that in his view the assets taken over from Auto-Bulbs, Ltd., were purchased at a figure out of all proportion to their real value; (b) some of the contracts entered into by the company were unprofitable; and (c) the overhead expenses were extravagant and excessive. The Official Receiver expresses similar views.

Loud Speaker Co., Ltd., 38, Palmer Street, Westminster, S.W.—Under the compulsory liquidation of this company the accounts show liabilities of £2,589 against assets of £1,176, and a deficiency of £1,613 with regard to contributories, the issued capital being 200 ordinary shares of £1 each. The Official Receiver reports that the company was incorporated as a private company on January 9th, 1929, and was promoted by Edward Cuthbert Little to acquire a wholesale wireless and electrical business previously carried on by him at the above address. Little states that his object in forming the company was to separate the wholesale from the retail part of the business. In April last the company was unable to pay off a balance of £275 outstanding on a debenture. Mr. G. D. Haynes was appointed receiver and manager on behalf of the debenture holder, and he carried on the business for a short time and eventually disposed of the stock, office furniture, and a small quantity of machinery, which realised £940, by public auction. He has handed over to the Official Receiver £156 on account of the surplus in his hands. The failure of the company is attributed by Little to the action of the debenture holder in appointing the receiver at a time when negotiations were being actively carried on for the payment of the company's debts by instalments. He states that this had the effect of pressure being exercised by the creditors, which resulted in the presentation of the petition upon which the winding-up order was made. In the opinion of the Official Receiver, the failure is due to mismanagement on the part of Little, who has handled the company's affairs in an extremely unbusinesslike manner and had failed to keep any proper books or records. Mr. E. H. Hawkins has been appointed to the post of liquidator, with a committee of inspection consisting of three creditors.

Graphones, Ltd.—Meetings, October 21st, at the offices of J. Wallace Williams & Co., 5, St. Andrew's Crescent, Cardiff, to receive an account of the winding-up by the liquidator, Mr. J. W. Williams.

A.E.G. Electrical Co. of South Africa, Ltd.—Last day for receiving proofs for dividend, October 10th. Liquidator, Mr. E. T. A. Phillips, Official Receiver, 33, Carey Street, Lincoln's Inn, W.C.

J. Barwell, Sons & Co. (Lighting), Ltd.—Particulars of claims by October 20th to the liquidator, Mr. J. A. Garland, 148, Edmund Street, Birmingham.

General Insulation Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. Bell, 46, Victoria Street, S.W.

G. Hill & Co., Ltd.—Winding up voluntarily. Liquidator: Mr. R. A. Page, Nottingham.

Winding-up Petition

Halcyon Wireless Co., Ltd.—A petition for the winding-up of this company has been presented to the High Court by Messrs. Green & Son, and will be heard in London on October 13th.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, Etc.	Price Sept. 30th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic .. .. per lb.	5¾d.	—
a	Ammoniac, Sal .. .. .. per ton	£60	—
a	Ammonia, Muriate (large crystal) .. ,,	£52	—
a	Borax .. .. ,,	£17	—
a	Copper Sulphate .. .. .. ,,	£25 10s.	—
a	Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a	,, Perchlorate .. .. .. ,,	5½d.	—
a	Shellac T.N. .. .. per cwt.	£4 5s.	—
a	Sulphur Commercial .. .. .. ,,	£11	—
a	,, Roll .. .. ,,	£11	—
a	Soda, Chlorate .. .. per lb.	3d.	—
a	,, Crystals .. .. .. per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks .. .. per lb.	3¼d.	—
	METALS, Etc.		
b	Aluminium, Ingots .. .. .. per ton	£95 to £100	£10 inc.
b	,, Wire .. .. .. per lb.	1/1 to 1/9	—
b	,, Sheet and Foil .. .. ,,	1/1 to 2/9	—
b	Babbits Metal and Anti-friction Metals—		
	Grade I .. .. .. per ton net	£119	£7 inc.
	Grade II .. .. ,,	£85	£4 inc.
	Grade III .. .. ,,	£49	£1 inc.
c	Brass (rolled metal 2" to 12" basis) .. per lb.	7¾d.	¼d. inc.
c	,, Tubes (solid drawn) .. .. ,,	9¾d. to 10d.	1d. inc.
c	,, Wire, basis .. .. .. ,,	8¼d.	¼d. inc.
c	Copper Tubes (solid drawn) .. .. ,,	10¾d.	1d. inc.
g	,, Bars (best selected) .. .. per ton	£75	£13 inc.
g	,, Sheet .. .. ,,	£75	
g	,, Rod .. .. ,,	£75	
d	,, (Electrolytic) Bars .. .. ,,	nom.	—
d	,, ,, Sheets .. .. ,,	nom.	—
d	,, ,, Wire Rods .. ,,	nom.	—
d	,, ,, H.C. Wire .. per lb.	7 1/32d.	¼d. inc.
f	Ebonite Rod .. .. ,,	1/3 to 1/6	—
f	,, Sheet .. .. ,,	1/3 to 1/6	—
n	German Silver Wire .. .. .. ,,	2/1	—
h	Gutta-percha, fine .. .. .. ,,	nom.	—
h	India-rubber, Para fine .. .. ,,	3¼d.	¼d. inc.
i	Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
l	,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g	Lead, English pig .. .. .. ,,	£15 15s.	£3 15s. inc.
g	Mercury .. .. per bot.	£18 to £18 10s.	£2-£2/7/6 inc.
e	Mica (in original cases) small .. per lb.	6d. to 3/6	—
e	,, ,, medium .. ,,	4/- to 8/-	—
e	,, ,, large .. ,,	8/6 to 17/6 & up	—
p	Phosphor Bronze, plain castings .. ,,	1/1½d.	—
p	,, ,, drawn bars & rods ,,	11½d.	1d. inc.
p	,, ,, rolled strip & sheet ,,	11½d.	1d. inc.
p	,, ,, wire .. .. ,,	1/0¾d.	¼d. inc.
o	Platinum .. .. per oz.	£9 19s.	£1 19 inc.
d	Silicium Bronze Wire .. .. .. per lb.	8¼d.	1d. dec.
r	Steel, magnet, in bars .. .. ,,	7¾d.	—
g	Tin, Block (English) .. .. .. per ton	£125 5s. to £127 5s.	£8 15s. to £9 15s. inc.
n	,, Wire, Nos. 1 to 16 .. .. per lb.	2/10	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Messrs. JAMES FORSTER & Co., in a letter dated September 26th, state that the lead market last week was entirely under the influence of the sterling exchange, the price readjusting itself according to the ruling rate of the £. On the news being known that sterling was no longer based on gold, the price opened 30s. per ton higher at £12 per ton, and it rose daily, closing at £15 10s., £4 15s. higher on the week. The rising tendency of prices was accompanied by considerable buying from the home trade, but whether actual consumption has improved is doubtful.

Electricity Supply

Lighting, Domestic, Power

Accrington.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department (engineer and manager: Mr. A. W. Clegg) for the twelve months ended March 31st last, show a total revenue of £81,089, and a working expenditure of £41,737, leaving a gross profit of £39,352. The corresponding figures for the preceding year were: Income, £82,419; working expenses, £44,525; gross profit, £37,894. After deducting capital and other charges there was a net profit of £3,446, as against £6,886 in the preceding year. During the year the capital expenditure amounted to £34,184, making a total of £613,860 now spent on the undertaking. Electrical energy sold decreased slightly from 17,907,615 to 17,853,263 kWh, and the maximum supply demanded from 9,200 to 8,800 kW. The average price obtained per kWh fell from 1.132d. to 1.086d. New consumers added during the year numbered 660, bringing the total up to 7,619.

Alderley Edge.—PROPOSED SUPPLY TO HANDFORTH.—Consideration is being given by the Alderley Edge and Wilmslow Joint Electricity Board to the question of carrying out an electricity scheme for the district of Handforth.

Ashbourne.—INAUGURATION OF SUPPLY.—A supply of electricity has been provided by the Derbyshire and Nottinghamshire Electric Power Co., and was inaugurated on October 1st.

Aylesbury.—YEAR'S WORKING.—A gross profit of £32,617, an increase of £940 over the previous year, is revealed in the accounts of the Corporation electricity undertaking for the year ended March 31st last. There was, however, a decrease of £1,949 in the net profit. The total revenue showed an increase from £62,233 to £69,629, the income from the rural area exceeding that from within the borough for the first time. The rural income, however, though approximately the same as the town income, is obtained from an area forty-four times greater than the town area, and from twice the number of consumers. Working expenditure totalled £37,012, as compared with £30,556 in the preceding year, while loan charges, etc., rose from £25,416 to £28,305. During the year the capital expenditure amounted to £40,670, making a total of £309,610 now spent on the undertaking.

CHANGE-OVER.—The Town Council has decided to carry out a change-over of the system of supply in Stoke Road at a cost of £364.

Bedford.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised mains extensions costing £950.

RURAL ELECTRIFICATION.—Under the Corporation Electricity Department's rural electrification scheme, 1,743 consumers have now been connected.

Bexhill.—TIME SWITCHES FOR SHOP-WINDOW LIGHTING.—The Corporation Electricity Committee recommends the hiring out of time switches for shop-window lighting at an annual rent of £1.

LOAN SANCTIONED.—Sanction has been obtained to a loan of £5,000 for mains and services.

Borth and Ynyslas (Cardigan).—SPECIAL ORDER.—Mr. John Butterworth and Mr. Harmar Goodman, have applied to the Electricity Commissioners for a Special Order authorising them to supply electricity in parts of the parishes of Cyfoeth-y-Brenin, Henllys, and Cynnull-Mawr in the rural district of Aberystwyth.

Brighton.—ALL-ELECTRIC HOUSES.—The Corporation Housing Committee has agreed to a suggestion of the Electricity Committee that the houses to be erected on Tarners estate should be all-electric.

LOANS SANCTIONED.—The Electricity Committee has received sanction to loans of £10,000 for static sub-stations, and £27,000 for electricity showrooms and offices in Castle Square.

Bromley (Kent).—STREET LIGHTING.—The Town Council has received sanction to a loan of £2,200 for providing centre suspension electric lighting in London Road, High Street, Market Square, and Widmore Road.

Canada.—VISIT OF FRENCH ENGINEERS.—A party of twelve French electrical engineers, including M. Charles G. Mallegarie, managing director of the Cie Parisienne de Distribution de l'Electricité, is paying a visit to Canada with the object of studying the hydro-electric systems in operation.

TRANSMISSION LINE CONSTRUCTION.—Construction work on the 200 miles of new power transmission line, over which Sudbury will receive electrical energy from the Abitibi Canyon development of the Ontario Public Service Corporation, a subsidiary of Abitibi Power and Paper Company, is now almost completed.

PROGRESS IN ONTARIO.—Despite industrial depression, the Ontario Hydro-Electric Power Commission reports a steady increase in the demand for power, there being no surplus of energy in any of the distributing systems of the province. The increased requirements of municipalities in the Eastern Ontario System have compelled the Commission to take its October 16,000 h.p. allotment of Gatineau power a fortnight earlier than its contract demands.

Chichester.—EXTENSION SCHEME HELD UP.—At a recent meeting of the City Council the Electricity Committee reported that, as a result of recent events, the proposal to proceed with the electricity extension scheme for the Manhood district was now in abeyance.

Chile.—ELECTRICAL DEVELOPMENT.—At the request of the Provisional Government the Compañia Chilena de Electricidad (which owns the largest central station in the State) has agreed to put in hand at once a number of construction schemes. Schemes involving a capital outlay of £1,000,000, and twice that amount to be spent in the near future, include a generating plant at Valparaiso, the extension of the Santiago distribution system, and the completion of the electrification of the second zone of the State railways (between Santiago and Talca, a distance of 155 miles). It is even hoped that, in conjunction with Argentine private interests, it may be possible to complete as a non-State-aided enterprise, the long-projected electrification of the Transandine railway in the north to connect Antofagasta with the Argentine railway system at Salta. The Chilean Government will not yet make any definite statement regarding further electrical enterprises, but it is known to wish to extend the State system of electrification to the Central Railway, from Santiago to Puerto Montt (670 miles), and the line from Santiago to Puerto San Antonio (70 miles). It is noted that German influence and German equipment, which a few years ago were predominant in the principal Chilean electrical centres, have now, like the British, almost completely disappeared in favour of North American enterprise.—*Reuter's Trade Service* (Santiago).

Continental.—FRANCE.—A return just issued shows that the output of power from the forty-seven most important electricity generating stations in France during May last amounted to 710,449,359 kWh, as compared with 859,146,176 kWh in the corresponding month of 1930, a decline of 17.31 per cent. Of the total, hydro-electric stations were responsible for 443,016,270 kWh and steam and internal combustion engine plants for 267,433,089 kWh. The return covers about 60 per cent. of the aggregate output of electricity in the country.

ITALY.—According to *L'Energia Elettrica*, the capacity of the electric power stations in Italy at the end of July last amounted to 4,362,000 kW, as compared with 4,220,000 kW at the corresponding date of 1930, an increase of 3.36 per cent. Of the total, hydro-electric plants were responsible for 3 583,000 kW and steam and internal-combustion engine stations for 779,000 kW. The output of electricity during the seven months ended July last is estimated at 5,593,096,000 kWh as against 5,840,007,000 kWh in the corresponding period of last year, a decrease of 4.23 per cent.

Cornwall.—ELECTRICITY CHARGES.—A conference is to take place between the chairmen of the Lighting Committees and the clerks of the Penzance Town Council and Camborne and Redruth Urban District Councils for the purpose of considering the advisability or otherwise of making an application to the Ministry of Transport to hold an inquiry into local electricity charges.

Coventry.—LOAN.—The Corporation Electricity Committee is applying for sanction to a loan of £20,770 for various development works.

Croydon.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £2,160.

Dalbeattie.—ELECTRICITY SUPPLY PLANS.—Plans have been prepared for the Kirkcudbright County Council for the distribution of electricity in the Stewartry, and work on the scheme will definitely commence this year. The maximum charges will be 8d. per kWh for lighting and 2d. for power, with minimum rates of 7½d. and 1½d. respectively. The Town Council has decided not to come to any decision for the present as to whether to offer opposition or not to the provisional Order which the County Council intends to promote, making that body the sole distributor in the area.

Darlington.—YEAR'S WORKING.—There was a profit of £10,496, as compared with £6,300 in the previous year, on the Corporation electricity undertaking for the year ended March 31st last.

Dundee.—ECONOMIES.—The Corporation is cutting down capital expenditure on the coal and ash-handling plant for the Electricity Department. The original estimate is to be reduced from £44,040 to £35,000, while £2,500 is taken off the estimate for static sub-stations, new tools, apparatus, and office machinery.

DOMESTIC WATER HEATING.—The Corporation Electricity Department announces a new charge for off-peak domestic water heating (from 11 p.m. to 7 a.m.) of ½d. per kWh consumed, and 2s. 6d. quarterly for use of meter and clock.

Earby.—YEAR'S WORKING.—A profit of £348 on the electricity undertaking is shown in Urban District Council's annual accounts. After two years' operation there is a reserve of £740. The capital outlay during the year amounted to £5,460.

East Ham.—BULK SUPPLY.—At a recent meeting of the Corporation Electricity Committee the engineer reported that a bulk supply would shortly be available from the London and Home Counties Joint Electricity Authority and that the terms had been approved.

LOAN SANCTIONED.—Sanction has been received to loans of £6,029 for mains and £2,435 for boiler-house extensions.

Fleetwood.—CORRECTION.—We have received a letter from Mr. W. P. Lilwall, engineer and manager of the Urban District Council Electricity Department, pointing out an error that occurred in our last issue with regard to the net profits

of the undertaking for the last two years. The figures should have been £6,101 in 1930-31, and £5,016 in 1929-30. Mr. Lilwall adds that the slight fall in the maximum demand for the past year was caused by a shortage of generating plant which necessitated a restriction being placed on consumers at peak periods. Large increases in load have taken place recently, and an ice works commenced operations last June at a rate of 4,000,000 kWh per annum; a new county school has also just been completed with a tubular heating installation of over 400 kW. It is hoped that a supply of electricity from the Central Electricity Board will be available by December.

Glasgow.—STREET LIGHTING ECONOMIES.—In view of the present economy campaign, a Corporation Sub-Committee has decided to discontinue for the present its policy of changing from gas lighting to electricity in certain streets. The saving which will be effected is estimated to be about £6,000.

Grimsby.—SUPPLY TO BRIGSLEY.—The Corporation is to provide a supply of electricity to Brigsley at a cost of £2,355.

Halifax.—ASSISTED WIRING.—The Corporation proposes to abolish the existing assisted-wiring scheme shortly and replace it by a system of 5s. down on application, and instalments through a pre-payment meter over a period determined by the number of lights. The charge for energy and the rental for any appliances in use will be collected by the same prepayment meter. Supplies of electricity will be given at a cheaper rate at periods of light load when the user exceeds a stipulated consumption, this being arranged by a separate meter. It is also proposed to lay service lines free of charge to the boundary of private property if within 60 feet of a main, and to offer special terms for distances beyond that limit.

Hamilton.—CHANGE-OVER.—The Corporation has applied to the Electricity Commissioners for consent to alter the system and pressure of supply from 480 to 240 V d.c. to 400 and 230 V, 50 cycles, a.c.

Irish Free State.—THE SHANNON SCHEME.—The Shannon Scheme is now in fairly general operation all over the Free State counties, and up to the middle of September the total number of consumers obtaining supplies from the Shannon was in the neighbourhood of 70,000. The total number of villages, towns and cities publicly lighted under the scheme was 144.

Japan. — ELECTRICAL DEVELOPMENT. — The Katsuura-gawa Power Co., has applied for permission to develop about 6,000 kW of hydro-electric power in the Tokushima Prefecture. The erection of a 3,000-kW steam power station in the neighbourhood of Tokamatsu is also contemplated by the company.

Lancaster.—SUPPLY TO NEIGHBOURING VILLAGES INAUGURATED.—The ceremony of switching on the electricity supply from the Corporation Electricity Works in Caton Road to the villages of Caton, Brookhouse, and Halton, was performed on September 23rd by the Mayor, Councillor James Hodkinson. An opportunity was afforded for the inspection of the Lancaster grid station, which the contractors, Messrs. Ferguson, Pailin, Ltd., hope to complete this month. The standard charge for energy in the new area is 9d. per kWh, and the villages are to be publicly lighted. Requests have also been received for supplies for Quernmore and Kellet.

Littlehampton.—COUNCIL TO OPPOSE SPECIAL ORDER.—The Urban District Council has decided to oppose the Littlehampton Electricity (Extension) Special Order, promoted by the Sussex Electricity Supply Co., Ltd., abolishing the Council's powers regarding the electricity undertaking which it would have in 1932 according to the present agreement.

London.—FULHAM.—The following reductions in electricity charges are recommended by the Borough Council Electricity Committee: Lighting (ordinary meters): From 3½d. to 3¼d. per kWh. Lighting (ordinary prepayment meters): From 4d. to 3¾d. per kWh. Lighting (rental prepayment meters): From 6d. to 5¾d. per kWh. Small power: From ¾d. to ⅝d. per kWh. Large power: From £3 10s. to £3 per kW, plus ¼d. per kWh and extra coal cost. A revision of the discount rates to large power and heating consumers is also suggested.

Mains extensions in Everington Street are recommended by the Electricity Committee at an estimated cost of £350.

Sanction has been received to loans of £12,500 for rental wiring, and £5,000 for domestic apparatus.

STOKE NEWINGTON.—The Borough Council Electricity Committee recommends the provision of a further £1,000 for cooker installations.

HACKNEY.—There was an increase from £268,264 to £290,214 in the total revenue of the Borough Council Electricity Department for the year ended March 31st last. Working expenses totalled £141,420, as against £130,068 in the preceding year, while the gross profit rose from £138,195 to £148,794. To the gross profit was added income from other sources, making a total of £154,147, and from this the following items had to be met: Loan charges £117,612; income tax, £10,564; other items, £1,900. There thus remained a net surplus of £24,071, as compared with £16,542 in 1929-30. During the year £134,000 was spent on capital account, making the total capital expenditure at March 31st £1,782,171. There was an increase from 40,715,074 to 41,711,841 kWh in the sales of electrical energy, this being the smallest increase since 1923. This was accounted for by a fall in power and factory lighting and bulk supplies, both of which show a decrease as compared with the previous year; domestic consumption rose from 13,490,594 to 15,969,292 kWh. The maximum supply demanded was 22,330 kW, as against 22,135 kW. New consumers added during the year numbered 4,874, making a total of 22,452 now connected. Since 1927 the number of consumers has more than doubled, this high rate of increase being largely attributed to the introduction of the free wiring scheme.

BATTERSEA.—The Borough Council Electricity Committee proposes to carry out the following schemes: Provision of services in 305 premises, £2,664; replacement with armoured cable of old vulcanised bitumen distributors in nine thoroughfares, £5,874; public lighting and mains extensions, £870.

Mansfield.—LOAN.—The Corporation Electricity Committee is to apply for sanction to the borrowing of £10,000 for the purchase of meters. Sanction has been received to loans of £22,500 for mains and services and £2,500 for sub-station equipment.

Morecambe.—YEAR'S WORKING.—The Corporation Electricity Committee reports a profit of £8,025 for the year.

Northern Ireland.—DUNGANNON.—It is intimated that the project for supplying electricity to Dungannon and district is to be carried out at an early date under the Northern Ireland scheme.

Padiham.—INQUIRY.—The Ministry of Transport recently held an inquiry into the Central Electricity Board's proposal to erect an overhead line between Padiham and Nelson, Burnley Corporation and others objected.

Preston.—SUPPLY TO NEIGHBOURING AREAS.—The Corporation has received a request from the Garstang Council for a supply of electricity, but as it is concentrating on Ribchester, a supply cannot be made available just at present. With regard to a request for a supply for Hambleton, the Corporation states that it is compelled to observe the terms of the Extension Order, which gives Preesall Council the right to supply. This right does not expire for two years.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

TYNEMOUTH.—Lighting flat rate: To 4¼d. per kWh. Lighting through prepayment meter: To 4½d. per kWh. Power: First 100 kWh a quarter, 3d. per kWh; next 300 kWh, 2d.; remainder, 1½d. per kWh. Factory rate: First 750 kWh a quarter, 1½d. per kWh; next 500 kWh, 1¼d.; remainder, 1d. per kWh.

ILFORD.—Residential tariff: Primary charge for electricity consumed for any domestic purposes to be 10 per cent. per annum of the rateable value, plus ⅝d. per kWh. Lighting flat rate: 3¼d. per kWh. Maximum demand rate for lighting: 5d. per kWh for the equivalent of one hour's use of maximum demand per day, and 1d. per kWh for all in excess of that amount. Maximum demand rate for power: 2d. and 1d. per kWh. Minimum consumption of 10,000 kWh per quarter for power: 2d. and 0.9d. per kWh. Power sliding scale: Up to 1,500 kWh per quarter, 1.75d. per kWh; from 1,500 to 10,000 kWh, 1.25d.; from 10,001 to 25,000 kWh, 1.15d.; 25,001 to 50,000 kWh, 1d.; beyond, 0.9d.

LLANDRINDOD WELLS.—Lighting: From 7½d. to 6½d. per kWh.

MANSFIELD.—Lighting flat rate: From 5½d. to 5d. per kWh. Prepayment meter lighting: From 6d. to 5½d. per kWh. Two-rate power: From 6½d. and 1½d. to 5d. and 1d. per kWh.

Swansea.—ELECTRICAL SCHEME ABANDONED.—The Corporation Electricity Committee has decided to delete two items from its programme of capital expenditure for the next five years. It is estimated that the total saving will amount to £72,000. In view of the projected agreement with the South Wales Electrical Power Distribution Co., it was decided to drop the Amman Valley scheme, which was to have cost £35,000, the balance of the saving being effected by abandoning the provision of a new boiler and accessories, which were to have been installed at the Strand power station.

United States.—EXTENSION OF KANSAS STATION.—As part of a general plan for the construction of a new 100,000-kW thermal station, the first 10,000-kW unit of the new plant was put into operation at Kansas City yesterday. *Power* states that this first unit comprises an installation of one 10,000-kW 13,200-volt, 3-phase, 60-cycle turbo-generator and one steam generating unit having a capacity of 150,000 lb. of steam per hour. All future turbo-generating units will be of not less than 30,000 kW capacity each. An unusual feature of the new plant is the circulation of the water supply through the surface condensers and thence to the settling basins. As the circulating water requirement at all times exceeds the needs of the water-works system, a remotely-controlled valve allows the excess to spill to a drainage ditch and thence back to the river.

West Ham.—SUPPLY TO L.N.E.R.—The Town Council has received sanction to loans of £10,000 for sub-station equipment and £14,710 for mains, in connection with the supply of electrical energy to the London and North-Eastern Railway.

Wishaw.—AUTOMATIC SUB-STATION INAUGURATED.—An automatic electric sub-station, the first of a series to be put into operation shortly by the burgh of Motherwell and Wishaw, was opened on September 26th at Faraday Avenue, Wishaw. The plant is entirely automatic and requires no attendance, starting and stopping to suit the conditions of load, and locking itself out under fault conditions. The contractors are Messrs. A. Reyrolle & Co., Ltd.

Traction

Accrington.—Tramway Abandonment.—The Corporation now intends to cease running trams between Accrington and Church. On December 1st 'buses will be substituted for trams on all routes.

Australia.—Melbourne.—The accounts of the Metropolitan Tramways Board for the year 1930-31 show a total revenue of £2,050,000, or £288,000 less than the previous year. After paying working expenses, interest charges, and municipal rates, there was a gross surplus of £238,000. From this £118,000 was withdrawn to meet statutory payments not associated with the tramway system. The surplus of £120,000 was placed to the general reserve fund. Under the Tramways Act the Board is obliged to make an annual payment to the reserve fund of not less than 4 per cent. on the gross capital expenditure. This for the year should be £325,000. As the surplus available is only £120,000, the report shows a statutory deficiency of £205,000, but in view of the decrease in revenue and the heavy statutory burdens this result is not a true reflection of the year's operations. Without the statutory payments of £118,000 the statutory deficit would have been only £87,000. Last year this deficit was £169,000. The operating expenses were reduced during the year by £263,000.

Bradford.—'Buses to Replace Railless Cars.—The Corporation Tramways Committee has decided to substitute 'buses for railless cars on the Frizinghall (*via* Canal Road) and Bolton Wood services.

Brighton.—Tramway Economies.—With regard to the present financial position of the tramway undertaking, the Corporation Tramways Committee recommends the abolition of return tickets.

Continental.—Russia.—It is reported from Moscow that the local authorities have received two proposals from German firms in connection with the scheme for the construction of an underground railway in Moscow, one each from French and English firms, and four from American companies. In the first place it is stated that discussions will take place with the foreign firms on technical questions concerning the scheme.

Croydon.—Track Construction.—The Corporation Tramways Committee is to construct a double track in North End at a cost of £1,610.

Darlington.—Year's Working.—The working costs of the Corporation trolley-'bus service for the year ended March 31st last averaged 8.7d. per mile. The profit on the undertaking amounted to £6,988, as compared with £3,736 in the previous year.

Japan.—Railway Electrification.—The electrification of the Joto line is contemplated by the Government Railway Authorities. The total cost of the scheme is estimated at 3,375,000 yen, of which 674,000 yen is for overhead equipment, 591,000 yen for sub-station plant, and 2,049,000 yen for electrical rolling stock.

London.—Eltham Tramway Extensions. — The London County Council's tramway extension in Westhorne Avenue, Eltham, was opened yesterday. This extension is a part of the scheme for linking up Grove Park terminus with Well Hall Road, Eltham.

Pedestrian Signals for Ludgate Circus.—The traffic signals at Ludgate Circus have been out of operation this week so as to permit the installation of signals for the direction of pedestrians. The signals, which are to have arms like railway signals, will be operated in conjunction with the traffic lights by the policeman in the control box.

Manchester.—Advertising on Tramcars.—The Corporation Transport Committee is considering a suggestion to introduce electrical advertising devices on the tramcars.

Middlesbrough.—Protection of Corporation Transport Undertaking.—The Northern Area Traffic Commissioners have refused an application by the Town Council for a 4d. minimum protective fare for its trams and omnibuses within the borough boundaries. The chairman of the Commissioners states that they can only concede 3d. as a minimum protective fare on privately-run services for journeys within the borough.

Redcar.—Protection of Railless Cars.—At a recent sitting of the Northern Area Commissioners an application for protective fares was received from the Tees-side Railless Traction Board. The chairman of the Commissioners said that the service did not come up to the standard of efficiency that entitled the Board to protection, and the Commissioners were prepared to give it protection for twelve months only by directing that private omnibuses should charge 1d. in excess of the trolley-vehicle fares on any part of the joint routes. The Board would protect its trolley 'buses against its petrol 'buses by the same method. The chairman said he hoped that the Board would scrap its trolley 'buses at the end of the twelve months.

South Africa.—Tramway Abandonment.—By the last South African mail we learn that the City Council of East London has decided to abolish its tramway system and substitute motor-'buses. The trams have reached the end of their useful and economical life, and if continued will require almost complete replacement. The capital invested in the tramway undertaking is £120,000, and the system has been in operation for thirty-one years. Losses have averaged £6,000 a year for the last five years.

Tynemouth.—Automatic Traffic Control.—Automatic traffic signals are to be placed at four points at North Shields by the Tynemouth Town Council at an estimated cost of £688. Application is to be made to the Ministry of Transport for a grant.

Telegraph and Telephone

Egypt.—New Radio Station.—The Siwah Oasis, in Western Libian desert, has been provided with a radio station. It was opened last month for the transmission and reception of telegrams in both Arabic and other languages.

Hull.—Telephone Service.—In the area administered by the City Corporation there are 17,075 telephones in use. The estimated population of the area is 350,000, and the ratio to every hundred persons thus stands at 5 to 1.

International Telephony.—Anglo-Estonian Service. — The British Postmaster-General announces that communication is now available between all parts of Great Britain and Northern Ireland and all parts of Estonia.

Rumania.—Telephony.—According to a report from Budapest, an order of the value of several million pengö has been placed with the Ver. Gluhlampen und Elektrizitatswaren A.G. in connection with the extension of the telephone network in Rumania. It will be recalled that the telephone system in that country a year and a half ago was leased to the International Telephone and Telegraph Company.

South Africa.—Automatic Telephony.—The six automatic telephone exchanges being constructed at Johannesburg are provisionally expected to come into operation on March 26th next. The system is the Strowger director type, manufactured by the Automatic Telephone Manufacturing Co., Ltd., for a six-figure numbering scheme.

U.S.A.—Telegraphy.—An elaborate scheme of co-operation has been arranged between the Western Union Telegraph Company and the Radio Corporation of America (Communications) Inc. for the co-ordination of their cable, telegraph, and wireless services. Under the agreement, which is not amalgamation, the Union has obtained the wireless services of the Corporation to supplement its cables to foreign countries. The Corporation in return has the use of the Union's station facilities for the collection and distribution of wireless messages and the use of its land wires and the office and delivery services. This agreement replaces the proposed merger of the Radio Corporation of America, the International Telephone and Telegraph Company, and the Postal Telegraph Company, which was abandoned because it conflicted with the Federal Anti-Trust Laws.—*Reuter* (New York).

Radio

Canada.—Control Litigation.—December 10th is the tentative date for the hearing in London of the appeal before the Judicial Committee of the Privy Council relative to the respective rights of the Dominion and the provinces to control broadcasting which the Supreme Court of Canada decided in favour of the Dominion.

Reduced Duty.—A discount rate of 30 per cent. on imported receiving sets under the general tariff will be allowed from September 10th to dealers in those articles, according to an Order-in-Council. According to *World-Radio*, the discount applies to the factory list price.

Canada's imports of valves, sets (not otherwise provided for), and complete parts during the fiscal year which ended March 31st, 1931, amounted in value to approximately £1,616,423. Of this amount, about £1,590,642 represented imports from the United States.

Italy.—Government Decree.—The *Official Gazette* has published the text of a new broadcasting decree which considerably modifies the existing convention between the State and E.I.A.R. The State concession has been granted for twenty-five years, beginning from 1927, but the State reserves the right, after 1947, to re-purchase the E.I.A.R. installations by giving a year's notice at a price to be fixed by agreement on the basis of a valuation, or by a court of arbitration, to consist of three members: one to be nominated by the Minister of Communications, one by E.I.A.R., and the chairman by the President of the Council of State.

Another clause in the decree specifies the power and date of opening of new stations, according to which Florence and Bolzano should begin operations next month, the 50-kW Milan station in February, and Bari in April, 1932.

Station Identification.—B.B.C. Charts.—The Corporation announces the publication of calibration charts which will enable the least technically minded of listeners to identify practically all those broadcasting stations which their sets are capable of receiving. The "World Radio Calibration Charts" booklet, in addition to full instruction on how to identify stations, contains specimen graphs for the medium and long waves and also sheets of squared paper on which users may construct their own charts. There is a complete list of stations (long, medium and short wave) with the average reception strength in Great Britain indicated by the character of type in which the names are printed.

U.S.A.—Valve Litigation.—The actions for damages brought against the Radio Corporation of America last July by twenty-one valve manufacturers on various grounds, including alleged violation of the Anti-Trust Law, have been settled by a private understanding. One of the actions was brought by the Dubilier Condenser Company for alleged infringement of a patent for an improvement to electron valve apparatus. The total of the claims against the Corporation was $23,350,000 (£4,800,000).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—VICTORIAN ELECTRICITY COMMISSION.—November 16th. Aluminium steel cored cable. (September 4th.)

October 20th. Postmaster-General's Department. Supply and delivery of testing instruments. Specifications, &c., from the High Commissioner, Australia House, London.—*Tenders.*

October 27th. Loading coil pots. Specifications, &c., from the High Commissioner, Australia House, London.—*Tenders.*

MELBOURNE.—December 1st. Post and Telegraph Department. Condensers. (A.X. 11111.)*

Belgium.—BRUSSELS.—October 7th. Telephone and Telegraph Administration. Telephone cables and accessories for the Ostend district. Particulars (Cahier des Charges Spécial No. 3,587) for 3.80 francs from the offices of the Administration, La Salle Madeleine, Brussels.

October 7th.—Société Nationale des Chemins-de-Fer Belges. Fifteen electric welding sets (50-cycle a.c.). Particulars (Cahier des Charges) from Service du Matériel, Division des Achats, Bureau 26-5, 21, Rue de Louvain, Brussels.

Derby.—October 5th. Tramway and Omnibus Department. Supply and erection of approximately 3½ miles of trolley-omnibus overhead lines. (September 11th.)

Egypt.—CAIRO.—October 28th. Department of Public Health. Electro-medical and X-ray apparatus for six months commencing November next. (A.X. 11069.)*

December 2nd. Ministry of the Interior. Complete power station for the town of Tantah. (A.X. 11066.)*

October 12th. Ministry of Public Works. Three-core cable for Atf pumping station. (A.X. 11109.)*

India.—NEW DELHI.—January 7th. Indian Stores Department. A.c. and d.c. ceiling fans. (A.X. 11116.)*

Lanark.—County Council. Various works, including electric lighting for new houses. Particulars from Mr. P. C. Smith, county housing and town planning engineer, 13, Clydesdale Street, Hamilton.

London.—SOUTHWARK.—October 21st. Borough Council. Cable. (September 11th.)

Manchester.—October 3rd. Electricity Committee. (a) L.p. water pipework (No. B.79); (b) motor-driven pump (No. B.80); and (c) structural steelwork for telpher at Barton Power Station. Specification (deposit £1 1s. each contract) from Mr. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

October 12th. Waterworks Committee. Four electrically-driven centrifugal pumps, with switchgear, pipes, valves, &c., at Lostock booster station. Specifications (deposit £2 2s.) from the waterworks engineer, Waterworks Offices, Town Hall.

October 13th. Public Health Committee. Cable for Withington Hospital, Nell Lane, West Didsbury. Specification from the superintendent of works, Public Health Department, Public Assistance Offices, All Saints, Manchester.

Marple.—October 10th. Electricity Department. Wiring for electric lighting and power installations, to be carried out under an assisted wiring scheme. Specifications (deposit £1) and form of tender from Mr. J. K. Law, electricity manager, Council Offices.

Muirkirk.—Baird Institute. Installation of generating plant. Particulars from Mr. J. Anderson, secretary, 166, Albert Place.

New Zealand.—WELLINGTON.—November 19th. New Zealand Railways. Intercall telephone system between Christchurch and Invercargill. (A. 11060.)*

February 29th. Three automatic railway sub-stations. (A.X. 11105.)*

Public Works Department. November 17th. Four 3,333-kVA oil-immersed self-cooled transformers. (A.X. 11079.)*

December 15th. 270 galvanised steel transmission line towers, complete with arms, ground stubs, and accessories. (G.X. 10703).*

November 10th. Post and Telegraph Department. 5,650 condensers. (A.X. 11101.)* and 2,300 lamp caps (A.X. 11102.)*

November 11th. Twelve time delay relays. (A.X. 11103.)*

November 17th. Resistance spools. (A.X. 11104.)* Twenty 700-ohm resistance spools. (A.X. 11114.)*

November 24th.—500 telephone mouthpieces. (A.X. 11115.)*

INVERCARGILL.—October 28th. City Council. Centrifugal low-lift pumping plant, including motor and control gear. (G.X. 10738.)*

CHRISTCHURCH.—November 12th. City Council. Pump, motor and control gear for Mays Road pumping sub-station. (G.X. 10774.)*

South Africa.—JOHANNESBURG.—October 22nd. City Council. Twenty 50 h.p. tramcar motors. (A.X. 11107.)*

BENONI.—November 9th. Municipal Council. Electrically operated automatic traffic control signals.

DURBAN.—October 12th. Corporation. Cable. (See this issue.)

West Riding.—October 12th. Mental Hospitals Board. Lamps. (See this issue.)

Wolverhampton.—October 13th. Corporation. Four sets of sludge pumps of the treble-ram, two-barrel, double-acting type driven by electric motors. Also one electrically-driven centrifugal pump. Specifications and form of tender (deposit £2) from Messrs. Dodd & Watson, Wellington House, Bennetts Hill, Birmingham.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bedford.—Watch Committee. Recommended:—
Automatic traffic signals (£208).—Barber & Colman, Ltd.

Chester.—Town Council. Accepted:—
Transformers and h.p. and l.p. switchgear for the Upper Northgate Street sub-station (£6,594).—Metropolitan-Vickers Electrical Co., Ltd.
Distribution switchboard (£543).—G. P. Dennis, Ltd.

Clydebank.—Fire and Lighting Committee. Accepted:—
Extension of lighting in Kilbowie Road, fitted complete with lanterns, cable, etc. (£154); and two standards at the Canal Bridge, Kilbowie Road, complete with lanterns, cable, etc. (£47).—General Electric Co., Ltd.

Croydon.—Public Assistance Committee. Accepted:—
Electrical fittings and appliances for six months.—Commercial Electric Co., Ltd.

Essex.—Public Assistance Committee. Accepted:—
Installation of electric lighting at Orsett Institution (£127).—A. Shearman.

Heston and Isleworth.—Urban District Council. Accepted:—
Four switchboard feeder control panels (£122).—W. Lucy & Co., Ltd.

Lamp Contracts.—The British Electric Transformer Co., Ltd., has received contracts for "Kye" electric lamps from the General Post Office, Capetown Electricity Department, Port Elizabeth Electricity Department, and the Burma Corporation, Ltd.

Morecambe.—Town Hall Committee. Accepted:—
Electrical installation at town hall (£831).—Edgar Backhouse, Ltd.

Stoke-on-Trent.—Public Assistance Committee. Accepted:—
Supply cable to Turnhurst Road institution and switchboard.—Callender's Cable & Construction Co., Ltd.
Cleansing Committee. Accepted:—
Battery replacement at destructor works (£100).—D.P. Battery Co., Ltd.
Electricity Committee. Accepted:—
Overhead wiring and services to houses on the Meir estate. (£154).—E. Holloway.
Housing Committee. Accepted:—
Wiring and fittings for twenty houses at Fenton estate.—Ex-Service Electrical Maintenance Guarantee and Supply Co.
Recommended:—
Wiring and fittings for fifty-seven houses on Fenton estate.—Edstan Electric Co.

South Africa.—CAPE TOWN.—City Council. Accepted:—
1,000 spare reflectors for street lighting fittings; 10 tons 0.025 sq. in. stranded hard-drawn copper wire.—British General Electric Co., Ltd.
Cooking and heating appliances for Roeland Street fire station.—S. A. General Electric Co., Ltd.
Fifteen tons 0.65 sq. in. stranded hard-drawn copper wire.—Guest, Sykes, Ltd.
—*South African Engineer and Electrical Review.*

Smethwick.—Housing Committee. Recommended:—
Electric light installations at houses.—Etna Heating & Lighting Co., Ltd.

Spenborough.—Education Committee. Accepted:—
Installation of electric lighting at Scholes and Roberttown schools.—F. Dutton & Sons.

Stirlingshire.—County Council. Accepted:—
Electrical work at new houses.—J. & J. Duff.

Forthcoming Events

Institute of Fuel.—Wednesday, October 7th. Institution of Electrical Engineers, London. 7 p.m. Joint meeting with other societies. "Coal: Smokeless Fuel and Oil from the National Standpoint." Dr. W. R. Ormandy.

Association of Mining Electrical Engineers (West of Scotland Branch).—Wednesday, October 14th. Royal Technical College, Glasgow. Presidential address. Mr. A. Dixon.

Institution of Engineering Inspection.—Wednesday, October 14th. Royal Society of Arts, London. 5.30 p.m. "Some Applications of Condensers to Electric Power Circuits." Mr. P. R. Coursey.

Birmingham Electric Club.—Friday, October 16th. Grand Hotel, Birmingham. 7 p.m. Ladies' night.

British Electrical Development Association.—Friday, October 16th. Royal Society of Arts. 7.30 p.m. "Light Therapy, with particular reference to Ultra-violet Irradiation." Dr. W. Beaumont.

Association of Supervising Electrical Engineers.—Saturday, October 17th. Lysbeth Hall, Soho Square, W. Dinner, whist drive and dance.

Our Service Department

Inquiries must be acompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

ICY-BALL refrigerator units.
HALLA infra-red lamps
VENTEX fuses.

Notes

Spain's New Electricity Regulations

A new series of rules and regulations regarding electric power and lighting installations, drawn up by the Comision Permanente Espanola de Electricidad, has lately come into operation in Spain. The regulations, *inter alia*, specify maximum voltages per sq. millimetre of conductor section for both underground and open-air use, necessary tests for armoured cables and insulators, the insulation and cooling of electrical machines and transformers, &c.

Better Mine Lighting

"The Candle Powers of Safety Lamps Before and After Underground Shifts," by Dr. T. David Jones, Ph.D., M.Sc., and Mr. C. E. Morgan, B.Sc.; "Comparative Photometric Tests of Miners' Electric Hand Lamps," by Prof. W. H. McMillan, B.Sc.; and "The Flame Safety Lamp; the Use of Reflectors," by Prof. R. V. Wheeler, D.Sc., and Mr. D. W. Woodhead, M.Sc., were the titles of three papers read at the summer meeting of the Institution of Mining Engineers in Manchester. That the lighting of European mines was a reproach to the mining industry was the firm view of Dr. J. Scott Haldane (Oxford) who, in opening the discussion, said that it could be improved by fairly simple means. Better lighting in European mines was essential from a purely humanitarian point of view. Miners suffering from nystagmus were not only a misery to themselves, but also to their relations.

Mr. P. L. Wood, of Manchester Collieries, Ltd., expressed the view that it was the battery lamp manufacturers who had not been able to provide them with better light. The alkaline electric lamp cost two and a half times as much as the ordinary lamp, but he was pleased to say that the manufacturers were now hiring them out. Under this scheme there was no excuse for poor lighting, for these lamps gave five times as much light as the ordinary lamp.

The lighting of mines from power mains was suggested and during the discussion it was stated that the cost was very small and the power consumed was very low. Mention was made of the difficulties with which the lamp manufacturers had had to contend owing to hard and fast regulations. The whole question of lighting is to be referred to a special committee of the Council of the Institution for consideration from every possible viewpoint. Visits were made to the Barton power station of the Manchester Corporation and the works of the Metropolitan-Vickers Electrical Co., Ltd.

B.S.S. for Electric Cut-outs

The eagerly awaited revision of British Standard Specification No. 88, Electric Cut-Outs, has now been issued and indicates a great advance in the performance of cut-outs as compared with the original specification. The scope of the new specification is, as in the old edition, confined to "ordinary duty" cut-outs, the term "ordinary duty" being defined as a function of the maximum short-circuit current in the circuit. The cut-outs are intended for use in 2-wire, 3-wire and multiphase circuits in which the voltage to earth does not exceed 250. Five sizes are standardised, as against four sizes in the old specification, this difference being due to the old 10-A size being displaced in favour of a 5-A and a 15-A sizes, corresponding to the standard ratings of plugs and sockets. The most important point wherein the new edition differs from the old is the introduction of a scientific test for blowing current, this test being designed (as the result of extensive investigations carried out by the Electrical Research Association) to ensure compliance with the requirement in the I.E.E. Wiring Regulations that the fuse-link shall be of such size that it will be melted in one minute or less by a current equal to twice the rating of the smallest cable protected by it. This test is at the same time designed to ensure that a fuse-carrier and link will have a reasonable life when carrying the rated current, and provides for the effect of preheating of the fuse-carrier and tolerances in the size and composition of the fuse-link. Further new tests introduced into the specification are an insulation-resistance test, a test for breaking capacity and a test for temperature-rise. Certain general requirements of a constructional nature are also included but the physical dimensions are not standardised.

Copies of the new publication (B.S.S. No. 88-1931) may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

Metallurgists' Conference

On Sunday, September 13, over 200 members of the Institute of Metals began their annual autumn meeting in Zurich, Switzerland. A party of 100 British members left London on the Saturday for the Conference, which was attended also by more than 100 foreign members from fifteen different countries. This cosmopolitan gathering, presided over by Dr. Richard Seligman, discussed twenty-five important original communications dealing with a wide range of metallurgical and engineering problems and discoveries, at a series of scientific sessions that terminated on September 15 with a steamer trip on Lake Zürich. The remainder of the week was devoted to a series of tours in Switzerland, in the course of which several large metal works were visited.

A 3,600 h.p. Electric Tractor

In the accompanying illustration is shown a 3,600 h.p. electric tractor recently completed for the express passenger service from Irun to Alsusua on the Norte Railway of Spain, at speeds up to 68.35 miles per hour.

The electrical equipment was designed and a considerable part of it made by the Metropolitan-Vickers Company, while the remainder of the electrical equipment and all the mechanical parts of the locomotive were made at the Reinosa works of the Sociedad Espanola de Construccion Naval.

The locomotive is of the 4-6+6-4 type, and weighs about 150 tons; it consists of two main trucks connected by an articulated coupling. The body, which terminates at the front of the driver's cab, is separate from the trucks, and rests on the usual pivot centres and bearers.

Each of the trucks has three driving axles and a standard Norte Railway guiding bogie truck. Each of the six driving axles is driven by two motors, which are rigidly mounted on the top of the trucks, and employ the Winterthur universal type of drive. The motors have a one-hour B.E.S.A. rating of 320 h.p. The control gear is of the electro-pneumatic unit switch type, arranged for 1,500-V d.c. supply.

Provision is made for series, series-parallel, and parallel motoring connections, each with field control steps, giving in all nine economical speed combinations, regenerative control

for operation on down grades is also provided, separate excitation of the motor fields for this purpose being obtained from a motor-generator set situated under one of the end covers.

The rating and weight of the new Norte Railway locomotive, viz., 3,600 h.p. and 150 tons, should be compared with the corresponding values for other notable electric locomotives, viz., G.I.P. Railway freight locomotives, 2,600 h.p., 120 tons; G.I.P. Railway passenger locomotives, 2,160 h.p., 100 tons; and South African Railways locomotive, 1,200 h.p., 69 tons.

Power Station in Old Mining Shaft

An electricity plant, probably the only one of its kind, has been installed at Kremnitz, Czechoslovakia, about 750 ft. beneath the surface of the earth in an abandoned mining shaft. Two turbo-generators are driven by the water from a brook conducted into the shaft. The water finds a natural outlet, so that the cost of the power produced is extremely small.—*Reuter's Trade Service.*

Standard Feed-water for Boilers

A boiler-water condition fitting so many cases that undertakings having power stations at different points throughout the U.S.A. have adopted it as standard is: 4 gr. per gal. of caustic alkalinity, 8 gr. per gal. of non-caustic alkalinity, and 5 concentrations. This might be varied to include nearly all conditions by specifying: 1 to 8 gr. per gal. of caustic alkalinity, 4 to 20 gr. per gal. of non-caustic alkalinity, and 3 to 10 concentrations, 1 A.S.M.E. or N.E.C.A. sulphate—alkalinity ratio being maintained.

Domestic Supply in Winnipeg

In Winnipeg, Canada, a city of more than 200,000 population, according to the *Electrical World*, 55 per cent. of the residence users of electricity cook on electric ranges; 40 per cent. of them use electric water heaters; 100 per cent. own electric irons; 45 per cent. operate toasters and vacuum cleaners; and 30 per cent. have electric washers. It is estimated that the 60,000 domestic customers own and use 60,000 irons; 32,500 electric ranges; 27,000 toasters; 27,000 vacuum cleaners; 23,500 water heaters; 18,000 washers; 5,000 refrigerators; 3,000 percolators; 1,300 floor polishers; 1,300 waffle irons; 600 electric clocks; and 500 ironers. The average annual consumption is 4,000 kWh per domestic consumer.

Institute of Metals

The Institute of Metals has just issued its full programme of meetings for the winter session both of the parent Institute and of its six Local Sections. Included in the subjects to be dealt with are electric welding of non-ferrous alloys; X-ray examination of alloys; refining of copper, new alloys in the brass foundry; and notes on condenser tubes and their packing. It is announced that next year's autumn meeting will take place during a visit to the United States and Canada, from September 3rd to October 8th.

A Large A.C. to D.C. Change-over

A.c. motors are now replacing d.c. machines for 27,000 drives in the River Rouge plant of the Ford Motor Company at Dearborn, Mich. Drives of production machines ranging in size from ¼ h.p. to 1,750 h.p., totalling 85,000 connected h.p., are affected, the *Electrical World* states. Benefits from the change include conspicuous reductions in costs of motor and control maintenance, ease of expanding production facilities as they occur in future, greater safety to workmen, reduction of energy losses in distribution lines and in conversions to direct current, reduction of sub-station operation labour, and the elimination of much connected capacity represented by over-motoring certain drives. The company has been at work on this job for about a year and now has it about one-half completed. At least another year will be needed to finish it. Some direct-current drives will remain; for instance, those on rolls in the steel mill.

Above 100 h.p., synchronous motors are used on all drives to which they can be adapted—compressors, blowers, pumps. and even on some large-production machines whose loads are uniform over considerable periods. The field controls of the synchronous motors are set at definite points to give the maximum average power-factor correction during normal operation of the whole plant and are not subject to adjustment by machine operators. Squirrel-cage motors are used on all drives below 100 h.p. and on many above, except in a very few cases where the slip-ring type is absolutely necessary. The object is to minimise the number of motor designs in use. Even on multiple-speed drives squirrel-cage motors with double stator windings are used in preference to the wound-rotor type.

Push buttons operating magnetic contactors constitute the standard control. The buttons are located at each machine or at strategic points along conveyor or handling systems. No compensators or other current-limiting starting devices are used, all motors being thrown directly across the line.

The change has already resulted in a 78 per cent. reduction of motor repair labour, for which 120 men are now employed instead of 550 men as formerly.

The Batti-Wallahs

The first meeting of the new session of this Society will be a luncheon to be held at the Hotel Metropole on Thursday, October 22nd, at 12.30 for 1 p.m. sharp. Lord Meston, K.C.S.I., will deliver an address on "India."

Electric Power in Mines

On September 21st Mr. Freeman asked the Secretary for Mines if he would state what kind of haulages were used underground in mines and whether he could state the total horse-power operating the various haulages; whether there were, in the view of his department, any advantages in the use of electrical power over compressed air as motive power; and whether he could state the approximate ratio of horse haulage to the total of mechanical haulage employed underground in mines in each of the inspection divisions.

Mr. Isaac Foot said that mineral was transported underground by various forms of rope haulage, by mechanical conveyors, by horse haulage, by manual labour, to a small extent by suitable locomotives, and by manifold combinations of these methods. In some circumstances, rope haulages and conveyors could be operated more economically by electricity than by compressed air but the question whether electricity might be used was primarily and strictly governed by considerations of safety. The aggregate horse-power of electric motors in use below ground for haulage, at June 30th, 1930, was 400,818, and for conveyors and loaders 22,426. He was unable to give any corresponding figures as to other forms of mechanical power and consequently unable also to answer the last part of the question. The number of horses employed below ground was 49,243.

Appointments Vacant

Assistant storekeeper for Kingston-on-Thames Electricity Department.

Probationary assistant engineer for the Engineering Branch of the Department of Posts and Telegraphs for the Irish Free State Civil Service Commissioners.

Sub-station attendant for Ilkley Electricity Department.

Overhead lines engineer for Hull Electricity Department.

Deputy chief official for Ashton-under-Lyne Electricity Department.

(See our advertisement pages to-day.)

I.E.E. Visit Barking Power Station

In conjunction with the Faraday Centenary Celebrations, members of the I.E.E. were entertained to luncheon on Thursday of last week by the County of London Electricity Supply Co., Ltd., at its generating station at Barking. Prior to the luncheon, the visitors were conducted over the buildings and the new extensions. Welcoming the guests, Sir Bernard E. Greenwell, vice-chairman of the company, said that work on the "B" generating station was up to schedule, and he hoped that this time next year the station would be sending out a supply. Electrical engineers, he said, were confronted with two problems—the cheap production of energy, and reduction of the capital costs of power stations. By producing the "unit" at a price that was less than the smallest coin of the realm, the first problem was well in hand, but rapid progress in the electricity supply industry could not be maintained if the second question was not solved; obsolescence was going to be a dangerous enemy in the future. Captain J. M. Donaldson, president-elect of the I.E.E., replied on behalf of the visitors. Leaving the power station the I.E.E. members embarked on s.s. *St. Katharine*, and were taken by the Port of London Authority for an inspection of the Royal Victoria and Albert and King George V Docks. Tea was served on board, and an enjoyable afternoon was concluded with the landing at Tower Pier shortly after 5 p.m.

The Women's Engineering Society

The annual conference of the Women's Engineering Society was held from September 25th to 28th at Crosby Hall, Cheyne Walk, Chelsea. On Saturday morning Miss Verena Holmes, B.Sc. (president), gave an address at South Kensington Science Museum on "Modern Locomotive Valve Gears," which included a technical description of the principal types of valve in use and also one of her own invention, which contains a number of advantages which, it is believed, are not found elsewhere in combination. The chief claim Miss Holmes makes for her gear is that it is the only infinitely variable one with which perfect timing of valve events can be obtained. In the twelfth annual report, Miss C. Haslett, C.B.E. (hon. secretary), reveals a year of progress, giving due prominence to outstanding work by members of the Society during the past year.

On Saturday evening the annual dinner of the Society was held at the Lyceum Club, and was attended by the presidents of those engineering institutions which admit women to membership.

Diesel-electric and All-electric Railways

So much has been published recently on the Diesel-electric system of traction, Mr. Adam Gowans Whyte points out in a communication to the Press, that it is important for the public to form a clear idea of the proper relation of this system to the railway electrification scheme outlined in the Weir Report. This point is all the more vital, since the claims made by leading representatives of the Diesel-electric system are conflicting.

Mr. Gowans Whyte reminds us that, at the meeting of the Armstrong-Whitworth Company on June 19th last, the chairman, Major-General Dawnay, said that "full electrification is undoubtedly appropriate to dense traffic areas; but on lines of low traffic density we believe that the truest economy lies in the use of Diesel-electric rail units, which are vastly cheaper in first cost than electrification and equally cheap to operate. We believe, in fact, that this system will establish itself as ancillary to electrification and effect substantial savings in capital expenditure to the railway companies."

During a visit of Members of Parliament to the Shipping, Engineering, and Machinery Exhibition on September 22nd, Lieut.-Col. Hitchins, a director of the same company (the principal makers of Diesel-electric traction equipments), said that the Diesel-electric system offered a happy alternative to this proposition (full electrification). Diesel-electric locomotives possessed all the advantages of the electric locomotive and operated in precisely the same way, except that the motive power was generated on board the locomotive.

Between being an "ancillary" and an "alternative" there is a radical difference. Engineering opinion, as a whole, is much more likely to endorse the chairman's view than that of his colleague. Major-General Dawnay's view, indeed, is substantially that of the Weir Report itself.

The main reasons for treating Diesel-electric traction as an ancillary to full electrification reside in the very point which Lieut.-Col. Hitchins mentions as if it were of no significance. Owing to the motive power being generated on the locomotive in the Diesel-electric system, it is strictly limited. A Diesel engine has practically no overload capacity; that is to say, an equipment rated at 1,500 horse-power cannot give materially more than that figure. Where, however, full electrification is adopted, each electric locomotive can draw upon a practically unlimited reservoir of power in the central electric station. Thanks again to the high overload capacity of the electric motor, an electric-train equipment rated at 1,500 horse-power can exert as much as 3,000 horse-power for short periods. This advantage enables an electric train to speed up quickly at starting and to maintain speed on heavy grades in an economical manner approached by no form of self-contained locomotive.

Full electrification has other elements of superiority, such as reduction of weight and noise and the absence of fumes. The one mentioned above is, however, fundamental, and it fully accounts for Major-General Dawnay's opinion that electrification and Diesel electrification should go hand in hand in the solution of the railway traffic problem.

Educational

WESTMINSTER COMMERCIAL INSTITUTE.—Lectures in electricity supply accounts and practice have now commenced at Burdett-Coutts' and Townshend Foundation School, Rochester Street, S.W.1, and will be held every Wednesday evening from 6 to 8 p.m. A similar course has also started at the Bow and Bromley Commercial Institute, Coborn Street, E.3.

UNIVERSITY OF LONDON.—A course of five lectures on "The Measurement of Light: Its Basis and its Significance," will be given at the Institution of Electrical Engineers, Victoria Embankment, W.C.2, by Mr. E. C. Crittenden, on October 16th, 21st, 23rd, 26th and 28th. Admission will be free, without ticket. (See our advertisement pages to-day.)

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Dr. S. L. Pearce has accepted the invitation of the Council of the Junior Institution of Engineers to become president of the Institution in succession to Col. Sir Henry G. Lyons. His induction will take place at a meeting to be held at the Royal Society of Arts, on December 4th, when he will deliver his address.

Mr. F. Courtier-Forster, superintending electrical engineer, H.M. Dockyard, Malta, who was for many years with the Director of the Electrical Engineering Department at the Admiralty, was married in Malta, on August 27th, to Mrs. W. M. Langley.

Mr. F. Trudgill has been appointed manager of Nelson Corporation electricity showrooms.

Mr. C. L. Rees, late of the staff of the West Gloucestershire Power Co., Ltd., and recently appointed assistant mains engineer at the Hastings Corporation electricity works, has married Miss Norrie Collins, of Gloucester.

Mr. H. Harding, of the Portsmouth Corporation tramways staff, has been presented by his colleagues with a Westminster chime clock on the occasion of his marriage.

Monsieur Charles M. F. Verliere, Inspector General of the French Posts, Telegraphs and Telephones, has been appointed a Commander of the French Legion of Honour.

Mr. J. Campbell has retired, owing to ill-health, from active management in James Hall & Sons, Ltd., but retains his seat on the board as consulting director. **Mr. A. C. Fendick** has joined the company as managing director.

Mr. Andrew Richardson, who is retiring after twenty-six years' service at the Carville Power Station, Wallsend-upon-Tyne, has been presented with a purse of money by his colleagues.

Mr. Arthur Hankey, of Bootle, who served his apprenticeship with Chadburn's (Ship) Telegraph Co., and later became associated with the Automatic Telephone Manufacturing Co., Ltd., has accepted the invitation of members of the Bootle Town Council to be nominated Mayor of Bootle for the coming year.

Mr. John J. King, "Dun-Laoghaire," The Poplars, Washington, Co. Durham, has been appointed the agent for Matterson, Ltd., for the counties of Durham and Northumberland.

Mr. W. A. Lane, director of Messrs. Berkeley & Young, Ltd., Tyseley, Birmingham, is now residing in London and acting as London manager of the new office and stockrooms at 41, Berners Street, Oxford Street, W.1.

At the annual meeting of the Leeds Electrical Club, on September 21st, **Mr. C. Nelson Hefford** was elected president, and **Mr. E. G. Sellers** hon. secretary for the ensuing year.

The **Rt. Hon. J. H. Whitley,** governing director of the British Broadcasting Corporation, and **Sir John Reith,** director-general of the B.B.C., paid a visit last week to the National Radio Exhibition. The photograph from which our illustration has been reproduced was taken while they were inspecting the stand arranged by the B.B.C. to illustrate its system as it exists and as it will be when the regional scheme is complete.

Mr. Whitley and Sir John Reith at the Radio Exhibition *(Photopress)*

Mr. W. Lawson has been appointed by Messrs. E. K. Cole, Ltd., as their area supervisor.

Messrs. Kincaid, Waller, Manville & Dawson have announced that the partnership existing between **Sir Edward Manville, Sir Philip Dawson, Mr. A. E. Jackson, and Mr. H. G. Simmonds** was to be dissolved at the end of September. Mr. A. E. Jackson, one of the partners, will, however, continue in practice on his own account, whilst retaining the name of the company with the full approval of the partners, at Abbey House, Victoria Street, Westminster, S.W.1 (telephone, Victoria 0631).

Lieut.-Col. W. A. Steel, who has directed the radio development of the Department of National Defence for Canada, has been appointed to the staff of the National Research Council, and will have charge of its radio research programme.

In a message dated September 29th *Reuter* stated: "The condition of **Mr. Thomas Edison** is worse to-day. The medical bulletin states that he had a very restless night and seemed slightly weaker this morning."

Obituary

Mr. Pearson Fisher.—The death is announced at Dumfries of Mr. Pearson Fisher, late technical engineer with Messrs. Arrol-Johnston and Aster Engineering Co., Ltd. Mr. Fisher was for several years employed by the Dutch Government in the design and execution of certain engineering work. On his return to this country he was employed in a managerial capacity by well-known firms, including Edward Chester & Co., Manlove, Alliot & Co., and the Mirrlees Watson Co., Ltd.

Mr. J. K. Bruce.—We regret having to record the death of Mr. Joshua Kidd Bruce, who last year retired from the post of general manager of the London County Council Tramways undertaking, owing to the condition of his health.

The late Mr. J. K. Bruce, former general manager of the L.C.C. Tramways *(Photograph by Russell, London)*

He passed away on September 23rd at his residence at Highgate in his fifty-ninth year, and the interment took place last Saturday morning at St. Marylebone Cemetery, East Finchley, after a service held at the Presbyterian Church, Highgate. Mr. Bruce was born at Strathmore. He came to London as a veterinary surgeon and entered the service of the original London Tramways Company when their cars were run by horses. He went over to the London County Council when the system was purchased, and had for many years past been closely identified with the great work of electrification extending over more than thirty years. He was appointed traffic manager in 1903; later became deputy chief officer under Mr. A. L. C. Fell; and in 1925 he succeeded that gentleman as general manager. We believe that it is not generally known how great a service Mr. Bruce rendered to the tramway organisation of London by the introduction of all kinds of new ideas and improvements for meeting the keen competition of the motor-omnibuses, giving tramway passengers speedier services and greater comfort. The London County Council on several occasions made special grants to Mr. Bruce to express its appreciation of the economical and efficient results which followed his work.

Dr. H. Phillips Davis.—The death is reported, at the age of 63, of Dr. Harry Phillips Davis, vice-president and director of the Westinghouse Electric & Manufacturing Co., and chairman of the National Broadcasting Co., at his home in Pittsburgh, Pa. For more than twenty-one of the forty years during which he was connected with the Westinghouse Co., Dr. Davis was in charge of the Engineering Department, and for fifteen years directed its engineering and manufacturing operations. Among his early achievements was his work in the electrification of the New York, New Haven and Hartford railroad, the world's first single-phase railway electrification. Nearly eighty patents were issued to him for his developments in electrical apparatus.

Mr. Stanley Gallagher, a director of the Hexham and District Electric Supply Co., has died at Hexham, at the age of 74.

Sir Gregory Foster.—We regret to learn of the death of Sir Gregory Foster, Bt., who was Provost of University College until December, 1929, when he retired, and Vice-Chancellor of the University of London, which office he relinquished in August, 1930. He was 65 years of age.

Will.—Viscount Knutsford, who was a director of the Underground Electric Railways Co., left £77,634 (net £64,528).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Macnamara Radio, Ltd. — Private company. Registered September 23rd. Capital £200 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in electrical and wireless apparatus of all kinds, etc. The subscribers are: E. B. Homer, 211, Queen's Road, Londonderry, Smethwick; and A. T. F. Foster, 132, McKean Road, Oldbury, near Birmingham. Solicitor: K. Povey Harper, 136, Corporation Street, Birmingham.

Newlectra Products, Ltd.—Private company. Registered September 25th. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of signs, radio, electrical, optical and scientific apparatus, etc. The directors are: C. W. Ward, 9, Calabria Road, Highbury, N., and H. A. Bartlett, Deans, 33, Penwortham Road, Sanderstead, Surrey. Registered office: 35, Bessborough Place, Grosvenor Road, S.W.1.

Henfrey (Electrical), Ltd.—Private company. Registered September 25th. Capital £100 in £1 shares. Objects: To carry on the business of electrical and radio engineers, contractors and manufacturers, etc. The directors are: H. Freedman and Mrs. Hilda E. Freedman, both of Templars, Templars Avenue, East End Road, Finchley, N.3 (also trading as Henfrey Installations). H. Freedman is permanent director and chairman. Registered office: 20, Kingsbury Parade, Burnt Oak, Edgware, Middlesex.

Blandford Radio, Ltd.—Private company. Registered September 22nd. Capital £2,000 in £1 shares. Objects: To carry on the business of electrical, wireless, mechanical and general engineers, etc. The directors are: G. A. E. Blandford (permanent managing director), The Halfway Shop, Hersham Road, Walton-on-Thames; and L. E. L. Smith. "Alrewas," Station Avenue, Walton-on-Thames. Solicitors: G. R. Smart, Walton-on-Thames.

Pegwin Electric Supplies, Ltd.—Private company. Registered September 19th. Capital £500 in £1 shares. Objects: To carry on an agency or agencies for the import, export and sale of electric lamps, reflectors, bells, fires, stoves, cookers, fans, irons and appliances; manufacturers of and dealers in dynamos, motors, armatures, magnetos, batteries, etc. The subscribers are: J. J. Farren, Villa Carmen, West Way, Rickmansworth, Herts, and H. W. Smith, 129, Cannhall Road, Leytonstone, E.11. J. J. Farren is to be permanent governing director and chairman. Registered office: Manfield House, Strand, W.C.2.

R. A. Webber, Ltd.—Private company. Registered September 23rd. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, electrical fittings, appliances, apparatus and accessories, gramophones, etc. The permanent directors are: R. A. Webber, 33, Belvoir Road, St. Andrew's, Bristol; and H. C. Joy, 19, Cowper Road, Redland, Bristol.

Returns of Electrical Companies

Windermere & District Electricity Supply Co., Ltd.—Capital £75,000 in 5,000 cumulative preference, 5,000 preference, and 5,000 ordinary shares of £5 each. Return dated April 13th, 1931. 5,000 cumulative preference, 4,000 preference, and 4,340 ordinary shares taken up. £23,850 paid on 3,040 cumulative preference and 1,730 ordinary shares. £42,850 considered paid on 1,960 cumulative preference, 4,000 preference, and 2,610 ordinary shares. Mortgages and charges, £9,900.

South London Electric Supply Corporation, Ltd.—Capital £750,000 in 50,000 6 per cent. cumulative preference and 700,000 ordinary shares of £1. Return dated April 7th, 1931. 30,000 preference and 494,000 ordinary shares taken up. £290,000 paid on 30,000 preference and 260,000 ordinary shares. £234,000 considered as paid on 234,000 ordinary shares. Mortgages and charges, £300,000.

Bideford & District Electric Supply Co., Ltd.—Capital £70,000 in 20,000 preference and 50,000 ordinary shares of £1. Return dated July 13th, 1931. 20,000 preference and 40,000 ordinary shares taken up. £60,000 paid. Mortgages and charges: Debentures for £20,000 issued to bankers as collateral security for overdraft.

Llanelly & District Electric Supply Co., Ltd.—Capital £650,000 in 350,000 preference and 300,000 ordinary shares of £1 each. Return dated April 29th, 1931. 300,000 preference and 200,000 ordinary shares taken up. £494,000 paid on 294,000 preference and 200,000 ordinary shares. £6,000 considered as paid on 6,000 preference shares. Mortgages and charges, £309,550.

Bonnella Brothers, Ltd.—Capital £7,000 in 1,000 preference and 6,000 ordinary shares of £1 each. Return dated July 29th, 1931. 450 preference and 5,000 ordinary shares taken up. £5,450 paid. Mortgages and charges, nil.

Alpha Electric Welding Co., Ltd.—F. Reed, Westgate Chambers, Newport, Mon., was appointed receiver on September 16th, under powers contained in debenture dated April 8th, 1927.

R. J. Richardson & Co. (London), Ltd.—J. Camp, Junr., 14, Serjeants Inn, E.C.4, was appointed receiver and manager on September 14th, under powers contained in debentures dated July 27th, 1923, July 21st, 1930, and May 29th, 1931.

Turner Radford & Co., Ltd.—Particulars filed of £300 debentures, authorised August 31st, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Berkeley & Young, Ltd.—Debenture dated September 14th, to secure £17,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: C. Wright, Stoneleigh, St. Bernard's Road, Olton, Warwick.

City Notes

The British Columbia Power Corporation reports gross receipts of $15,119,945 for the year ended June 30th last, as compared with $15,434,342 in the preceding year. Operating expenses, taxes, depreciation, and renewals amounted to $10,097,388, as against $11,144,435, leaving a net revenue of $5,022,557 ($4,289,907) after payment of interest, dividends on preference stock, and the usual dividend of $2 per share on the class "A" shares, $436,815 is carried forward. Expenditure during the year on additional electrical plant, together with the extension of electricity and gas services, and improvement and additions to other sections of the business, amounted to $5,015,968.

Ferranti, Ltd., report a net profit of £60,689 for the year ended June 30th last, as compared with £68,749 in the preceding year, to which is added £40,741 brought forward, making £101,430. After deducting the preference dividend and expenses of the increase and reorganisation of capital and the public issue of 250,000 preference shares, it is proposed to pay a dividend of 6 per cent., less tax, on the ordinary shares, leaving £35,980 to be carried forward. The report states that considerable extensions to plant have been made and buildings have been added to during the year. Meeting: October 5th.

The Ransome & Marles Bearing Co., Ltd., reports a trading profit for the year ended June 30th last of £44,056, as compared with £54,745 in the preceding year, and a net profit of £18,406. It is proposed to pay a dividend of 4½ per cent., less tax (against 6 per cent.).

The Southern Brazil Electric Co.'s report for the year ended December 31st last shows a loss of £4,092, which, with a debit balance of £33,937 brought forward, makes the debit to be carried forward £38,029. Operating profits, including income from investments in Brazil, were £50,353, a decrease of £17,569, as compared with the previous year.

Edgar Allen & Co., Ltd., report that the results of the current year's working and the immediate trade and financial outlook render it advisable that its financial resources shall be conserved so far as possible. The payment of the dividend on the 5 per cent. cumulative preference shares for the half-year ended September 30th will therefore be deferred.

The West London & Provincial Electric & General Trust, Ltd., has announced an interim dividend of 2½ per cent. on the ordinary shares (against 4½ per cent.).

The Montreal Light, Heat & Power Consolidated has declared a dividend of $0.37 on the common shares for the quarter ended September 30th.

The Eastern Telegraph Co., Ltd., has announced a dividend at the rate of 3½ per cent. per annum, less tax, on the preference stock for the quarter ended September 30th.

The Midland Counties Electric Supply Co., Ltd., has announced an interim dividend of 2½ per cent. (Same.)

Stocks and Shares

TUESDAY EVENING.

FINANCIAL events have followed each other with such extraordinary rapidity that the slump of one day has been succeeded by the boomlet of the next, which in its turn has given way to a fresh wave of depression, to be succeeded by a more steady condition of affairs and a strengthening of prices. Advances have occurred in the shares of most of the electrical manufacturing and equipment companies. The devaluation of the £ sterling, and the expectation of a tariff on manufactured goods, have combined to stimulate a strong demand for shares of this class. There was not a great deal of cheap supply available, and as soon as this was absorbed, prompt recoveries in price ensued. The Stock Exchange Committee has ordered that all dealings shall be for cash. This has little effect upon stocks and shares in the investment markets, but it imposed a sharp check upon speculative activity.

The Weakness of Investment Stocks

Investment stocks and shares are mostly lower, and materially so. There have been heavy falls in British Government securities, and in other stocks of similar character. The 4½ per cent. debenture stocks of the Central Electricity Board and the London and Home Counties J.E.A. have fallen to 87½. This is a fall of 7 points, and it raises the yield on the money to £5 2s. 10d. per cent. Home Railway prior charge stocks of the best class are also down, though those of more speculative character are inclined to improve. The ordinary issues of most companies show advances. Metropolitan consolidated ordinary stock is 1 up at 36½, but Underground Electrics have gone back to 17s. 6d., apparently on the closing of a few bull accounts. British Electric Traction deferred has fallen 50 to 650, and the company's 5 per cent. debenture stock is 2½ lower at 95½, the second debenture stock being also easier at 84½.

Home Electricity Shares

Movements in the shares of the Home electricity companies have been erratic. Such a catalogue of variations has not been seen in these pages for months, possibly for years, past. The rises in ordinary shares considerably outnumber the falls,

but preference shares in every group are 6d. to 2s. down. The ordinary shares are better, with few exceptions. Amongst the latter, City of London at 35s. are 2s. down. South Londons and Kensingtons are both a little easier. Notting Hill preference at 10⅛ are 15s. lower. The demand runs upon ordinary stocks and shares, popularly called equities, on account of the conviction that fixed interest issues are bound to follow the example of the Government group, and to be sold by holders who recognise the reduced spending power of money. If, on the other hand, trade recovers, it is the ordinary shares which will stand to benefit.

An Illuminating Example

This will help to explain the reason why preference shares have come down in price during the past week. From the point of view of the prospective seller, what makes the matter worse is the fact that buyers are anything but anxious to come forward, even at the lowered quotations. One example may suffice of what is going on. A man desired to sell 350 preference shares in an electricity supply company. For some time past, the price had been standing on a 5 per cent. basis of yield, but on attempting to realise, the proprietor found that the only bid he could obtain was at a price 2s. below the nominally quoted figure. It is not that actual security of shares has become impaired. What has happened is that the country, having left the gold standard for the time being, the value of money has taken on a different aspect, unfavourably affecting prices of fixed-interest stocks and shares.

Cables and Wireless

The argument that ordinary and deferred issues are the best things to have at the present time applies to Cables and Wireless stocks, for the reason that the 5½ per cent., although actually a preference issue, is not in present receipt of a dividend. For practical purposes, it may be regarded, therefore, as a speculative stock. On this the price spurted 4 points, taking with it the "A" ordinary and the "B" ordinary stocks, although, of course, to a smaller extent. Of the other issues in this group, Anglo-American preferred is down 5 points to 96½. Great Northern Telegraphs at 23½ show a gain of £1. Marconi Marines at 32s. 6d. are 6s. 3d. up. Globe Telegraph and Trust preference at 6¾ are quoted ex dividend. The ordinary shares at 5½ are the fraction to the good. American Telephone & Telegraphs, being dollar shares, are 20 points higher at 180. Internationals at 21½ have put on no more than ½. Western Union reacted to 125 after being 132.

Dollar Stocks

As mentioned here last week, the temporary abandonment by this country of the gold standard has the automatic effect of putting up prices of stocks and shares quoted in American dollars. Most of the issues connected with the United States, Canada and Brazil, have gone ahead. Power Corporation of Canada shares at 45½ are 8½ up. Shawinigan at 37½ show a gain of 5 points. Pennsylvania Water at 65 are nearly 10 dollars higher. Montreal Light & Power at 47½ are 9 up. Rio Tramway 5 per cent. debenture bonds rose 13½ to 110, but came back to 98; the company's second bonds at 80 are 3¾ points up. Sterling debenture stocks, such, for instance, as that of the San Paulo Tramway fives, quoted at 72½. and showing a drop of 4 points on the week, are lower. Tokyo Electric 6 per cent. bonds at 87½ are 6 points up.

Iron, Steel, and Rubber

The most active market in the Stock Exchange, apart from that for British Government stocks, is the iron, coal, and steel department. The turnover of shares is remarkably large every day. Substantial rises have occurred during the past week on the assumption, of course, that devaluation of the £ is equivalent to a bounty upon exports, and that it will enable British companies to compete on level terms with foreigners. Babcock & Wilcox, 7s. 6d. higher at 50s., Vickers, and practically all the shares in this department have participated in the improvement. Another market in which greater activity has developed is that for rubber shares.

Manufacturing and Equipment Shares

For reasons akin to those set out in connection with iron, steel, and rubber, shares in the group connected with manufacturing and equipment companies enjoyed sharp improvements. Callenders rose 12s. 6d. to 3, Enfield Cables went up 6s. 3d. to 3⅛, Henleys 12s. 6d. to 5⅜, Siemens 2s. 6d. to 22s. 6d., British Aluminium 8s. 9d. higher to 39s. The best prices were not held in every case, and in the reaction Callenders and British Insulated came back to 2⅜, and Enfields to 3¾. General Electrics hold a gain of 11s. 3d. at 47s. 6d., and Henleys, like Siemens, retained the full extent of their advance. Associated Electrical Industries at 23s. 3d. are 7s. higher, and examination of this brief list of shares is sufficient to make the observer rub his eyes in astonishment that so rapid a change could have occurred in the course of a week's Stock Exchange dealing. Telegraph Constructions are 10s. higher at 11. Brush ordinary stock has not moved from its low level at 55.

Side by side with rises which may, without exaggeration, be called startling, there have come falls in the preference shares of the manufacturing group. Both classes of General Electric preference, for example, are lower, and the same tendency is to be observed in this section as in all other markets where fixed interest stocks are negotiated. It is necessary to emphasise the somewhat nominal character of markets.

Share List of Electrical Companies

Home Electricity Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Sept. 29, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	£ 1	15	15	58/9	+1/6	5 2 2
Brompton Ordinary	1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb.	Stock	—	4½	87½	—7	5 2 10
Charing Cross Ordinary	1	8½	8½	29/6	—6d.	4 15 0
Chelsea	1	8½	8½	28/–	—	5 0 0
City of London	1	10	10	35/–	—2/–	5 14 3
Clyde Valley	1	8	8	31/3	+3/3	5 2 4
County of London	1	11	11	43/3	+2/–	5 1 9
Edmundsons' 7% Pref.	1	7	7	25/–	—1/–	5 12 0
Elec. Supply Corporation	1	11	11	42/6xd	+1/–	5 3 6
Kensington Ordinary	1	8	8	29/–	—6d.	4 16 7
Lancs. Light and Power	1	7	6½	23/6	+2/3	5 10 8
London & Home Counties 4½% Deb.	Stock	—	—	87½	—7½	5 2 10
London Electric	1	8½	9	32/6	—1/–	5 10 9
Metropolitan	1	9	10	38/9	—	5 3 1
Midland Counties	1	6½	7	27/6	+1/6	5 1 10
Mid. Elec. Power	1	15	8	28/3	+9d.	5 13 3
Newcastle-on-Tyne Ordinary	1	6	6	23/3	+2/–	5 3 3
Do. 7% Pref.	1	7	7	25/–	—½	5 12 0
Notting Hill 6% Pref.	10	6	6	10⅛	—⅜	5 14 3
North Met. Elec. 6% Pref.	1	6	6	21/6	—3/–	5 11 7
St. James' and Pall Mall	1	8	8	29/–	—6d.	4 16 7
Scottish Power	1	8	8	27/–	+9d.	5 18 6
South London	1	8½	8½	26/6	—6d.	5 5 8
Urban Ordinary	1	7	7	28/3	—	4 19 1
Westminster Ordinary	1	8½	8½	28/–	—1/–	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–xd	—1/6	7 2 10
Yorkshire Elec.	1	8	8	31/3	+1/6	5 2 5

Home Rails

Central London Ord. Assented	Stock	4	4	75	—	5 6 8
Metropolitan	,,	4	3½	36½	+1	9 10 0
Do. District	,,	5	—	58½	—	8 11 0
Underground Electric	1	8	8	17/6	—1/–	9 2 10

Telegraphs and Telephones

Anglo-Am. Tel. Pref.	Stock	6	6	96½	—5	6 4 6
Do. Def.	,,	1½	1½	24	—½	6 5 0
Cables & Wireless 5½% Pref.	Stock	5½	5½	45½	+4	—
Do. A 7½% Ord.	,,	Nil	—	12	+2	—
Do. B Ord.	,,	Nil	—	9	+3	—
Globe Tel. and T. Ord.	10	10	5¼	5½	+⅛	—
Do. do. Pref.	10	6	6	6¼	—¼	8 17 10
Great Northern Tel.	10	20	20	23½	+1	8 10 2
Marconi-Marine	1	15	15	32/6	+⅜	9 4 7
Oriental Telephone Ord.	1	12	12	2½	—	*5 12 11

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	5½	—	7/6	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	18	—	—
British Electric Traction Def. Ord.	,,	5	5	650	—50	—
Do. do. Pref. Ord.	,,	8	8	112½	—10	7 2
Brazil Traction	100	8	—	13	+2½	—
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	93	—3½	5 7 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/–	—	—
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 8
Mexican Light Common	100	Nil	Nil	20	—	—
Do. 7% Pref.	100	7	7	50½	—	13 17 2
Do. 1st Bonds	—	5	5	57½	—	8 13 10
Victoria Falls Ord.	1	15	15	63/9	+⅜	4 14 1
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

Manufacturing Companies

Assoc. Elec. Ord.	1	6	6	23/3	+7/–	5 2 2
Do. Pref.	1	8	8	25/–	—3/3	6 8 0
Babcock & Wilcox	1	15	14	50/–	+⅛	*5 12 0
British Aluminium Ord.	1	10	10	30/–	+7/6	6 13 4
British Insulated Ord.	1	15	15	⅜	+⅛	5 4 4
Brush Ord.	Stock	10	5	55	—	9 1 10
Callenders	1	15	15	2½	+⅛	5 4 4
Do. 6½% Pref.	1	6½	6½	23/9	—¼	5 9 5
Crompton Parkinson Ord.	5/–	30	30	22/6	+⅛	6 13 4
Do. 8% Pref.	1	8	8	28/3xd	—6d.	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23/3	+6d.	6 9 0
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	3⅜	+⅛	6 11 0
English Electric	1	Nil	Nil	5/–	—	—
Do. do. Pref.	1	Nil	Nil	5/–	—	—
Ferranti Pref.	1	7	7	20/–	—	7 0 0
G.E.C. Pref.	1	6½	6½	23/–	—6d.	5 13 2
Do. Ord.	1	14	10	47/6	+1/6	4 4 3
Henley	1	30	30	5⅜	+⅛	5 11 7
Do. 4½% Pref.	5	4½	4½	4⅜	—	5 2 10
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Phillips	1	10	10	25/–	—	8 0 0
Siemens Ord.	1	7½	7½	22/6	+⅛	6 13 4
Telegraph Construction	12	10	7½	11	+⅛	8 3 10

* Dividends paid free of Income Tax.

Italian Economy Measures

"Equality of Sacrifice"

THERE is a topical interest in the report* of Mr. E. H. Mulock, H.M. Commercial Counsellor at Rome, on economic conditions in Italy, which has recently been issued by the Department of Overseas Trade, for it deals in some detail with the efforts made in that country to remedy the depression by adopting the principle of equality of sacrifice for all classes.

Mr. Mulock gives an interesting survey of the steps taken with a view to reducing public expenditure, the cost of living, and the disparity between wholesale and retail prices. The culminating point in the necessity for these steps was the very large budget deficit which resulted about the end of last year from the burden of unemployment relief and reconstruction work, combined with the shrinkage in revenue from taxation. It was then decided to introduce legislation reducing by 12 per cent. the salaries and allowances of all employés of the State or public bodies, a reduction which, it was intended, should lead to an acceleration in the fall of prices and rents.

The Government's Action

The Government took the lead in price cuts by lowering by 10 per cent. prices of provisions sold in the stores open to its employés, and the syndical associations inaugurated a general movement in favour of reductions (varying from 8 to 25 per cent.) of rents of shops and houses, of certain agricultural and industrial wages, of salaries of clerical and business staffs, of directorial and managerial incomes and of hotel and restaurant charges.

Signor Mussolini estimated that in consequence of these and similar economies 3,000 million lire at least of circulating medium would be released, reducing to that extent the need of currency for the normal transactions of Italian business life.

Mr. Mulock says that the bold action of the Fascist Government constitutes an outstanding example of its policy of assisting and encouraging trade, industry and agriculture. It has also adopted other methods.

External Trade Measures

The facilities offered under the exports credits scheme have been increased. The " nationalist " industrial policy of the Fascist Government of insisting on the use, in carrying out Government contracts, of raw, semi-raw or manufactured materials produced in Italy, if available, instead of materials imported from abroad, has been rigidly observed. At the same time this embargo on imported material is raised when contracts for foreign Governments are in question, and Customs facilities are accorded with the object of encouraging pioneering in industry.

* Stationery Office. Price 4s. net.

Electricity Supply Statistics

There are in existence statistics relative to about 93 per cent. of the power producing concerns in the country. The electrical energy produced by these concerns in 1930 amounted to a total of 10,024 million kWh, compared with 9,458 kWh in the previous year. This was made up of 9,721 million kWh hydro-electric and 303 million kWh " thermic " power in 1930, compared with 9,116 million kWh and 342 million kWh respectively in 1929. In addition to the above, 164 million kWh and 243 million kWh of power were imported in 1930 and 1929 respectively.

The total electrical energy produced, including that imported, during the first three months of 1931 amounted to 2,277 million kWh compared with 2,438 million kWh in the corresponding period of 1930. The power used for illuminating purposes in 1930 amounted to 829 million kWh, against 785 million kWh in the preceding year.

At May 1st, 1931, there were 1,179 electrical undertakings (of which 307 possessed a capital of over one million lire) and their share capital amounted in the aggregate to 11,000 million lire. In addition the total of their loans contracted abroad outstanding at the same date was 2,741 million lire, an increase of 286 million lire over the total on May 1st, 1930.

The Società Adriatica di Elettricità is extending its business relations abroad. Last year the European Electric Corporation, Ltd., was organised under its auspices in Montreal, and it has large investments in the Compagnie Italo-Belge pour Entreprises Electriques, which is interested in Central and Eastern European countries. In 1930 it also formed the Iberian Electric with head offices in Montreal and offices in Madrid. The Adriatica is likewise connected with the Galileo Società Hellenique d'Electricité founded in Athens with a participation of British and Greek groups. The Commercial Counsellor points out that the Adriatica with its affiliated companies took part in the formation of British and International Utilities, Ltd., interested in plans for electrification in the agricultural districts of Lincolnshire.

Electrified Railways

The length of line in Italy at present electrically operated is 10 per cent. of the whole of the State Railway system and carries about 20 per cent. of the total traffic. The longest continuous stretch of electrified line is that from Modane to Turin, Genoa and Leghorn, a distance of 500 km. The quantity of coal saved during one year by the use of electric power was estimated at 638,000 tons, almost one-quarter of the present consumption for steam traction, and the economy in annual expenditure thereby effected was computed at 88 million lire.

Italy's Foreign Electrical Trade in 1930

THE following statement, showing the imports into and exports from Italy of electrical goods during 1930 has been compiled from the recently-issued official trade statistics. The figures for 1929 are added for purposes of comparison and notes of any increases or decreases are made.

On the import side the most prominent item was electric carbons, purchases of which were almost halved. There was also a substantial reduction in accumulator imports. On the other hand, the imports of heavy plant and machinery showed a rise. Great Britain secured the lion's share of the increase in imports of generators and motors; in fact, the quota taken from this country in 1930 was between six and seven times the 1929 figure.

The principal item of interest in the export list was the fall in shipments of armoured cables from 37,000 to 21,000 quintals.

Imports

	1929. Quintals.	1930. Quintals.	Inc. or dec. Quintals.
Electric generators and motors—			
Total	21,500	26,700	+ 5,200
From Germany	9,800	11,730	+ 1,930
„ Great Britain	680	4,490	+ 3,810
„ Switzerland	2,500	2,420	— 80
„ United States	1,200	970	— 230
Static transformers—			
Total	4,900	5,400	+ 500
Electricity meters—			
Total	2,200	1,600	— 600
Ammeters and other electrical instruments	370	300	— 70
**Telegraph and telephone apparatus—*			
Total	16,500	22,600	+ 6,100
Carbons, electric—			
Total	44,000	24,000	—20,000
Insulators, porcelain, &c.			
Total	1,900	1,400	— 500
From Germany	800	700	— 100
„ France	1,000	280	— 720
Accumulators—			
Total	5,900	3,900	— 2,000
Magnetos—			
Total	780	680	— 100
Other electrical apparatus and parts—			
Total	23,000	19,500	— 3,500
From Germany	9,200	11,500	+ 2,300
„ Great Britain	7,000	1,700	— 5,300
Electric lamps—			
Total (thousands) ..	15,500	11,380	— 4,120
From Austria	937	1,535	+ 598
„ Germany	7,210	7,200	— 10
Insulated electric wire or cable, covered with rubber or textiles	1,300	1,700	+ 400
Ditto, armoured, including submarine cables	2,300	2,300	—

Exports

	1929. Quintals.	1930. Quintals.	Inc. or dec. Quintals.
Insulated electric wire or cable, covered with rubber or textiles	4,700	7,500	+ 2,800
Ditto, armoured, including submarine cables	37,000	21,000	—16,000
Electric generators and motors—			
Total	27,900	25,700	— 2,200
Static transformers	2,600	2,700	+ 100
Accumulators	1,700	2,700	+ 1,000
Magnetos	170	95	— 75
Electricity meters	160	290	+ 130
Telegraph and telephone apparatus	250	350	+ 100
Radio apparatus	320	720	+ 400
Insulators, porcelain, &c. ..	3,300	2,500	— 800
Lamps—			
Total (thousands) ..	2,450	3,024	+ 574

* Including radio apparatus, 9,600 q. in 1929, and 16,400q. in 1930.

Wages in the Electricity Supply Industry

Employers' Statement: Reductions Recommended

WE have received from Mr. A. H. Banks, as employers' industrial adviser of the National Joint Industrial Council for the Electricity Supply Industry, copies of letters which he has addressed to employers' representatives on all the District Councils and to their secretaries.

The first, dated August 31st, reviews the position which has developed in consequence of the termination by the trade union side of the National Joint Industrial Council of the cost-of-living sliding scale agreement of January 4th, 1921.

Recent Negotiations

It is pointed out that during the years 1928-1930 the National Council agreed to suspend the operation of the sliding scale, and the cost to the employers, together with a special advance of ½d. per hour, given as a condition of stabilisation, was £1,047,178. On the resumption of the sliding scale on January 1st this year, there should have been a reduction of 1d. per hour, but the employers agreed to a reduction of ½d. per hour, costing them £285,594 up to the end of June.

The unions gave notice to terminate the agreement as from June 30th. The matter was considered by the Negotiating Committee of the National Joint Industrial Council, when the employers claimed a national reduction of wages and the unions an increase of ½d. per hour and a reduction of hours to 44 per week. Certain proposals were jointly agreed for submission to the National Council, but upon coming before the Council the recommendation was not approved, as the unions intimated that they would not agree to any proposal which might result in a reduction of the existing rates at once or in the future.

National or District Settlements?

The employers thereupon claimed a reduction of 1d. per hour, in lieu of the 1½d. which would have been due under the sliding-scale agreement, and offered arbitration in the event of non-agreement. The reduction was refused, and at a later special meeting of the National Council the unions stated that they were unwilling to continue national negotiations and desired to commence separate negotiations in each of the thirteen districts, without pledging themselves to arbitration in the event of failure to agree in the districts.

The employers, after consideration, adhered to the principle of national negotiation, and resolved that this should be continued on their claim for a penny per hour reduction. The unions pressed for separate district negotiations, and a special joint committee was appointed to deal with the situation.

The special committee met on July 28th and the unions then acquiesced in the resumption of national negotiations but not in arbitration in the case of non-agreement. In response to their request, the employers agreed to maintain the existing wages until August 31st, to enable the unions to take a ballot of their members. On August 27th the unions reported that the ballot was against any reduction, and they refused to negotiate nationally or to accept arbitration.

The employers deprecate the decision of the unions to abandon national in favour of district negotiations. They state that their action has not been influenced by any recent economic disturbances, but results from a careful study of all material facts influencing the general wage situation. The general level of wages in the electricity supply industry is 99 per cent. above the 1914 level, as compared with a figure of 70 per cent. for the general level of wages, of which statistics are published by the Ministry of Labour. The present level of wages in the industry is related to a cost-of-living figure of 66 per cent., as compared with an actual cost-of-living figure of 45 per cent., not taking into account the special increase of ½d. per hour granted on January 1st, 1928, and still in force, which actually raises the level from 66 to 72 per cent. It is pointed out that the industry is being pressed to lower its charges in order to assist the manufacturers to compete in world markets and that the reduction in wages would enable this to be done.

Statement Not Disputed

The second letter, dated September 21st, states that the figures contained in the communication of August 31st have been submitted to the trade union representatives for examination, and none of the data or figures has been shown to be wrong. The facts are summarised and a statement by Mr. W. Addington Willis is quoted, to the effect that the ability or inability of an industry to pay increased wages is not the only factor to be considered; reference should be made to the general standard of wages and conditions in the area.

It is maintained that the refusal by either side of the Council to submit to arbitration in case of disagreement compels the other side to take independent action, which is quite inconsistent with successful collective negotiation.

Early Reductions Proposed

The employers, having been forced into the position of taking independent action, are of opinion that such action should be uniform throughout the country, and after careful consideration of all the material facts they recommend that as from and including October 15th, 1931, or the nearest convenient date thereto, the wages of all employés whose wages have in the past been regulated in accordance with the agreements made from time to time by the National and/or District Councils should be reduced as follows: Weekly wages for 48 hours, by 3s. per week; weekly wages for 47 hours, by 2s. 11¼d. per week; and hourly wages by ¾d. per hour.

After the above reductions the wages in the electricity supply industry will remain related to a level of 18 per cent. above the cost of living figure, and 20 per cent. above the general level of wages in the country.

It is stated to be important that undertakers should give the proper notice necessary to give effect to the above change of wages, the length of which notice may vary in different undertakings, and it is recommended that the reductions should not be applied so as to reduce the wages of any man below 11¼d. per hour, or its weekly equivalent.

The New Zealand Radio Market

A REPORT on the market for radio apparatus in New Zealand, furnished by H.M. Trade Commissioner at Wellington, has been received from the Department of Overseas Trade. This states that the number of licences issued at February last was 63,293, distributed in Auckland (18,577), Canterbury (10,242), Otago (6,949), and Wellington (25,681).

There are comparatively few stations and few good artists in New Zealand; the demand is, therefore, for radio sets capable of receiving from Australian stations operating at a distance of from 1,200 to 2,500 miles, and from American stations some 4,000 miles away. The Wellington station operates at 5 kW, Auckland, Christchurch, and Dunedin stations at 500 watts, and, in addition, there are some thirty smaller stations in existence. Fine selectivity is thus essential.

Battery sets have largely disappeared from the market, and the demand for British crystal sets for local reception, introduced three or four years ago, has now fallen off. All-electric sets, complete with separate loud speakers are preferred, almost every district being well served with electricity at 230 V. There is a certain demand for portable sets. The retail price of a set is about double the landed duty-paid cost.

At the recent radio exhibition held in Wellington, the great majority of the radio sets shown were products of the United States. The fact that there was no English-made set in the exhibition provoked a certain amount of comment. It is stated that importers have made repeated attempts to obtain the agency of some English manufacturers, but have been unable to discover a set suitable for the market, and English manufacturers have expressed the opinion that the New Zealand market is not of sufficient size and importance to warrant the making of new arrangements in the factory in order to produce a suitable set. For the manufacturer entering the market, it is considered advisable that his interests should be entrusted to some wholesale firm with considerable experience. When approaching a possible agent, it is necessary to supply catalogues, price lists, information as to discounts, and other relevant particulars.

It must not be forgotten that the present-day sets soon become obsolete, so that the opportunities in the future in New Zealand will be attractive for any British manufacturer who can produce a suitable set at a reasonable price. The New Zealander will generally purchase British products in preference to American if manufacturers make such a course at all reasonable.

The Customs duties payable on sets are: British preferential rate, 12½ per cent.; general tariff, 42½ per cent.; Australian tariff, 12½ per cent. For apparatus peculiar to wireless telegraphy the duties are: British preferential rate, free; general tariff, 30½ per cent.; Australian rate, free. A surtax of nine-fortieths of the duty is also imposed, and in the case of duty-free goods a surtax of 3 per cent. *ad valorem* is levied. The import statistics show that the United States supplied 105,672 radio sets in cabinets in 1930, the total British share (United Kingdom, Canada, and Australia) being 16,816.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

High-torque Motors

I was very interested to read Mr. Sandeman's note on high-torque motors in your issue of September 11th, and the resulting letter by "Standardisation," in your issue of September 25th.

Ordinary squirrel-cage and light-torque motors have very different speed-torque characteristics, up to about 60 per cent. of full speed. In choosing the type of motor and starter for any particular drive, the torque developed should not exceed the torque required by too great a margin, otherwise the acceleration may be unnecessarily severe, with results similar to those described by your correspondent.

It seems to me, however, that "Standardisation" has been particularly unfortunate in his experience, for, although my principals have supplied many hundreds of high-torque motors, I have never yet heard of a similar complaint about them.

"Standardisation" does not state the methods of starting used, nor any details of the drives or driven machinery, and without these, his statement that "there was a craze . . . which died," etc., appears altogether too sweeping. Even in these days, with accumulated experience, the choice of the best type of motor and starter for any particular drive still merits more attention than it often receives. I agree, however, with "Standardisation" that high torque motors are frequently installed when an ordinary squirrel-cage motor would really be the better proposition. Sometimes, however, they are put to work under conditions which suggest that a slip ring motor would be better and cheaper in the long run.

I do not think, however, that the position to-day is quite the same as that of a few years ago, because many factors have resulted in more attention being paid to the starting performance of ordinary squirrel-cage motors, with a resulting improvement.

W. P. RICHARDSON.

Birmingham, *September 25th*, 1931.

"Pull Together"

The I.E.E. summer meeting has passed in a whirl of visits, broken only for a brief period to pay respectful homage to the memory of Michael Faraday, and now in the calm which follows one has time to ponder over the meeting and its associations and to consider what lessons are to be learnt.

The first lesson is, I think, that it is instructive and often helpful to see how the other fellow does his job, whether it be overhauling railway rolling stock, providing a super-efficient broadcast service, or making biscuits, or motor cars.

Secondly, it is up to all of us to pull together now for the common good, to bring this old country of ours out of the slough of despond into which she has fallen. Whatever our individual creed or calling the call must be "pull together"; we don't want internal cut-throat competition at a time like this.

One wonders at a time like the present what Michael Faraday himself would have done had he been alive to-day. Although a thinker and philosopher, he was above all things practical in his dealings with the problems which confronted him, as his many-sided excursions into the realms of scientific research will show, and in such a time as the present I feel convinced he would have been well in the van.

Britain needs men of vision in her national emergency, men who are not afraid to put self-consideration last in their work for the common good. We cannot have too many keen intellects attacking our problems. However the political situation may stand, and whatever the Government of the day may think necessary to decide, they are entitled to absolute support from all classes.

The whole world may not be ours, as gentlemen adventurers, in the light in which it was in Raleigh's time, but there are still markets at home and abroad to be won, territories where our own particular products are unknown.

Let us think big, and act big, even as Faraday himself did in his labours for science, and with one sustained effort force this country of ours, of which we at heart are so intensely proud, right through the mists into the perfect atmosphere of honest, unassailable prosperity beyond.

F. E. SCHOFIELD.

Manchester, *September 26th*, 1931.

A Golden Opportunity!

Now that we are off the Gold Standard and excluding the question of tariffs, British electrical manufacturers have such a wonderful opportunity opened up to them that I would appeal to them to grasp it with both hands, not by increasing their prices but by reducing them, even should raw material cost them somewhat more.

I recall some years ago when Continental suppliers of accessories were offering goods that were so poor in quality that the whole trade turned to the possibility of using English-made goods, which were then about 20 per cent. higher. The response, however, of the English manufacturer was, instead of reducing prices because of the increased demand, to increase them by about 15 per cent., throwing a golden opportunity away, and customers back into the arms of Germany.

I doubt if to-day's opportunity will recur, and if it is grasped, I say without fear of contradiction, the bulk of the electrical accessories required in the industry (which is still a long way from saturation point), can now be secured for all time by the English manufacturer.

C. J. M.

London, E., *September 28th*, 1931.

High Speed in the Wire Mill

The installation during the past few years of high-speed machinery in the leading wire manufacturing firms throughout the country may be said to have almost revolutionised the industry. But full agreement does not yet appear to have been reached that the revolution is beneficial to the industry as a whole.

Many contend, however, that by the older, slower process the finished wire was softer and more consistent in gauge than the product of the modern machine, and that the amount of scrap made was very much less. Also that the modern machine demands to be fed with a perfect coil of drawing-down wire, whereas the old machines used up many a length that would nowadays go into the scrap tub. On the question of scrap alone, one of the most formidable cost items in a wire mill, they contend that the gain in speed is more than offset by excessive waste and imperfect material.

Many of the opponents of the high-speed system, it is worth noting, are to be found among the most experienced and skilled wiredrawers in the country, but, as often happens, a skilled craftsman is not necessarily an expert at costing. From his viewpoint it is first and last the quality that matters.

The final decision of the issue will be found outside the industry—among the actual users of the wire produced under modern conditions. Complaints of harshness, variability of gauge, etc., among the users of wire, have become more frequent, and the test of durability has yet to be fully established.

On the other hand, it must be admitted that much of the wire formerly produced was more highly finished than was perhaps necessary for its particular use, and that while the test of accurate costing has proved conclusively the advantages in the long run of the modern system, it would have been sheer ineptitude to have allowed the foreign manufacturer to win the field while the skilled craftsman still clung too obstinately to his cherished ideals.

The views of your readers would be of interest regarding the speed limit at which copper can be drawn without impairing its inherent and characteristic qualities.

STANLEY KERSHAW.

Stockport, *September 25th*, 1931.

Meter Test-houses

Many supply undertakings do not attach sufficient importance to the work of their meter departments, particularly with regard to the periodical changing, overhauling, and testing of all meters connected to the supply mains, with a view to maintaining their accuracy under working conditions. Your readers may be interested to hear of the system adopted by an undertaking in the south-west of England with an output of about 20 million kWh per annum. There are about 8,000 consumers, and it is the practice to change all meters after being in service for three years. These changes are carried out by the outside meter department.

All new connections are carried out by the distribution department, and meters fixed by them are obtained from the testing department stores. Meters removed for routine changes are sent to the test room, where they are immediately tested for accuracy at all loads. They are afterwards dismantled for cleaning, examination of jewels, spindles, etc., and the fitting, where necessary, of new parts. The meters are again tested and calibrated, and afterwards repainted and returned to the stores for future use. This system includes all switchboard instruments, current limiters, demand indicators, as well as the meters connected to the consumers' supply mains. The testing department also maintains a chemical laboratory for the testing of fuel, transformer and other oils, water, etc.

Defective meters are reported daily by the meter readers, who are supplied with printed forms for the purpose, giving all particulars of defects likely to be met with. In the test room there are four test benches, one for d.c. meters, one for a.c. meters when testing by stop-watch or dial readings, using a standard indicating wattmeter, and two for a.c. meters for use with rotating standards. The standard meters are also periodically checked, and the corrections tabulated for the testers' reference. The main a.c. apparatus consists of: a current transformer with secondary tappings to give from 5 to 100 A., with a full-load current of 5 A. in the primary; a potential transformer with tappings in the secondary winding to give up to 500 v., in short stages, with coarse and and fine adjustments; variable resistances, for tests at ½ to 1/200 full load; variable inductance; ammeter, 0 to 5 amps; volt meter, 0 to 500 volts. The arrangement of the apparatus and the circuit diagrams are not difficult, and the work of installing an up-to-date test room can readily be carried out. I am convinced, from my own observations of the monthly operating costs, that the initial expense involved is amply repaid.

H. J. ARTHUR.

Wolverhampton, *September 27th*, 1931.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

7,496. "Commutation of direct current in drum-wound electric motors." Akt.-Ges. Brown Boveri et Cie. March 30th, 1929. (356,231.)

9,132. "Telegraphic installations." Siemens & Halske Akt.-Ges. April 11th, 1929. (Patent of addition not granted.) (356,100.)

13,149. "Distance relays for electric lines." Akt.-Ges. Brown, Boveri et Cie. June 29th, 1929. (356,174.)

13,508. "Controllers for electric motors or the like." International General Electric Co., Inc. May 1st, 1929. (356,104.)

13,830. "Electric discharge tubes." Edison Swan Electric Co., Ltd. May 4th, 1929. (356,234.)

14,101. "Electrical measuring instruments." H. Butler. December 8th, 1930. (356,289.)

15,791. "Electric order telegraphs." T. R. Warren, T. W. Ross, and Associated Electrical Industries, Ltd. May 22nd, 1930. (356,108.)

15,794. "Electric power-generating systems." British Thomson-Houston Co., Ltd. May 22nd, 1929. (356,176.)

15,838. "Electron valves." Dr. S. Loewe. May 22nd, 1929. (356,109.)

15,841. "Thermal cut-out switches." Aktiebolaget Birka Regulator. May 25th, 1929. (356,110.)

15,873. "Electrically heated cooking stoves." G. H. Collins and H. F. Collins. May 23rd, 1930. (356,177.)

15,895. "Thermionic valve circuits." Standard Telephones & Cables Ltd. (A. H. Reeves). May 23rd, 1930. (356,111.)

16,188. "Thermionic amplifying systems." International General Electric Co., Inc. May 25th, 1929. (356,113.)

17,022. "Electric incandescent lampholders." Edison Swan Electric Co., Ltd., and H. C. Wheat. June 2nd, 1930. (356,160.)

17,051. "Electric switches in which the contacts are separated beneath an electrically conducting quenching liquid." Siemens-Schuckertwerke Akt.-Ges. August 20th, 1929. (356,180.)

17,055. "Protective arrangements for electrical apparatus." General Electric Co., Ltd., and W. Wilson. June 2nd, 1930. (356,181.)

17,064. "Battery-charging systems, particularly for batteries supplying telephone installations." C. Loog. January 28th, 1930. (356,165.)

17,166. "Television apparatus and the like." J. M. MacLuclich. June 24th, 1929. (356,201.)

17,218. "Circuit arrangements for electric supervisory installations." C. Lorenz Akt.-Ges. June 7th, 1929. (356,206.)

17,222. "Machines for making telephone cables." Standard Telephones & Cables, Ltd., and H. J. Deacon. June 4th, 1930. (356,207.)

17,223. "Telegraphic receivers and retransmitters." Creed & Co., Ltd., and F. G. Creed. June 4th, 1930. (356,208.)

17,224. "Electric telephone and like transmission systems." Standard Telephones & Cables, Ltd., and S. H. Grove. June 4th, 1930. (356,209.)

17,225. "Thermionic valve circuits." Standard Telephones & Cables, Ltd. (A. H. Reeves). June 4th, 1930. (356,210.)

17,233. "Electric signalling systems." Automatic Telephone Manufacturing Co., Ltd., T. R. Rayner and G. A. Burns. June 4th, 1930. (356,211.)

17,300. "Telephone systems." Telefonaktiebolaget L. M. Ericsson. June 21st, 1929. (356,217.)

17,311. "Electric heating devices." S. Thompson. June 4th, 1930. (Addition to 335,540.) (356,219.)

17,323. "Synchronising means for use, for example, in television and the like systems." Gramophone Co., Ltd., and A. Whitaker. June 4th, 1930. (356,247.)

17,334. "Electrical switches with means for extinguishing the arc by gas under pressure." S. Ruppel. June 3rd, 1929. (356,221.)

17,362. "Apparatus for controlling the speed of a d.c. electric motor." A. Reyrolle & Co., Ltd., and F. N. Linstow. June 5th, 1930. (356,250.)

17,456. "Electric vacuum-tube circuits." British Thomson-Houston Co., Ltd. June 5th, 1929. (356,257.)

17,459. "Electric synchronising systems." British Thomson-Houston Co., Ltd., and A. J. Maddock. June 5th, 1930. (356,258.)

17,468. "Electric cells." M. A. Codd. June 5th, 1930. (356,259.)

17,534. "Direct-current dynamo-electric machines." K. W. D. Roberts and Associated Electrical Industries, Ltd. June 6th, 1930. (356,267.)

17,535. "Electromagnetic clutches." L. H. A. Carr and Associated Electrical Industries, Ltd. June 6th, 1930. (356,268.)

17,571. "Hunting-switches particularly for use in automatic or semi-automatic telephone systems. Standard Telephones & Cables, Ltd. (W. Hatton.) June 6th, 1930. (356,272.)

17,646. "Telephone transformers." Graham Amplion, Ltd., and A. D'A. Hodgson. June 6th, 1930. (356,273.)

17,647. "Transmitting apparatus for wireless telegraphy and telephony." Graham Amplion, Ltd., and A. D'A. Hodgson. June 6th, 1930. (356,274.)

17,743. "Arrangements for controlling electric motors." General Electric Co., Ltd., and E. C. Davies. June 7th, 1930. (356,282.)

17,812. "Electric furnaces." L. W. Wild and Wild-Barfield Electric Furnaces, Ltd. June 10th, 1930. (356,298.)

17,826. "Liquid-break electric circuit-breakers." British Thomson-Houston Co., Ltd. June 10th, 1929. (356,300.)

18,269. "Methods for indicating failures in pipe lines." T. R. Warren and Associated Electrical Industries, Ltd. June 14th, 1930. (356,322.)

18,299. "Modulating systems." Marconi's Wireless Telegraph Co., Ltd. July 10th, 1929. (356,323.)

18,424. "Polyphase rectifiers." Associated Electrical Industries, Ltd. June 18th, 1929. (356,329.)

18,773. "Electrical or mechanical tripping devices." G. S. Marstone and J. G. Statter. June 19th, 1930. (356,338.)

19,509. "Thermionic valves." Lissen, Ltd., and J. E. Clark. June 26th, 1930. (356,352.)

19,832. "Mercury-vapour lamps." A. Steinmann. July 1st, 1929. (356,355.)

19,847. "Combined apparatus for the reproduction of talking-machine records and the reception of radio signals." Gramophone Co., Ltd., and A. H. Cooper. June 30th, 1930. (356,356.)

20,210. "Position indicators for electrical switches and like fittings." A. Lulki. July 4th, 1929. (356,361.)

20,972. "Telephone and like electric cables." Hackethal-Draht-und-Kabelwerke Akt.-Ges. July 10th, 1929. (356,376.)

21,533. "Electric trolley collector gear." R. Sayles. July 16th, 1930. (356,386.)

21,775. "Electrical signalling systems, telephone systems, and the like." Ericsson Telephones, Ltd., P. Doig and L. W. Smith. July 18th, 1930. (356,389.)

22,105. "Photo-electric cells." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Feb. 25th, 1930. (356,395.)

22,226. "Electric motor control systems." General Electric Co., Ltd., C. W. Saunders, H. W. Wilson, and S. A. G. Emms. July 23rd, 1930. (356,398.)

22,820. "Electric discharge tubes." "Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Sept. 27th, 1929. (356,407.)

22,989. "Radio-receiving apparatus." E. K. Cole, Ltd., E. J. Wyborn and A. W. Martin. July 30th, 1930. (356,413.)

23,675. "Electric rotary switches of the kind as used in automatic telephone systems." Siemens Bros. & Co., Ltd., and A. J. Escott. Aug. 7th, 1930. (356,420.)

24,440. "Switch, bell-push, plug socket, and other electrical units, and the mounting of such units, or assemblies thereof in wall or other boxes, carriers, frames, or the like." Wandsworth Electrical Manufacturing Co., Ltd., T. Bachelor and A. B. Smith. Aug. 15th, 1930. (Cognate applications 25,096/30 and 2,398/31.) (356,431.)

26,200. "Electric switches with arc extinction by self-generated vapour pressure." Siemens-Schuckertwerke Akt.-Ges. Nov. 22nd, 1929. (356,468.)

27,073. "Railway light signals, relays, and the like." A. S. Cachemaille (General Railway Signal Co.) Sept. 10th, 1930. (356,481.)

28,738. "Television, tele-cinematograph and the like systems." Compagnie pour la Fabrication des Compteurs et Matérial d'Usines à Gaz. Oct. 12th, 1929. (Addition to 39,614/29 and 350,443.) (356,506.)

29,601. "Electrical condensers." Westinghouse Electric & Manufacturing Co. Oct. 28th, 1929. (356,521.)

30,018. "Warning beacons or indicators of exposed high-tension conductors as a safety-device more particularly for air vessels." British Thomson-Houston Co., Ltd. Oct. 7th, 1929. (356,524.)

30,190. "Mercury-vapour lamps." A. Steinmann. Oct. 9th, 1929. (356,527.)

31,875. "Amplifying system for use with devices for electrically reproducing sound vibrations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Dec. 21st, 1929. (356,546.)

33,589. "Television apparatus." Fernseh Akt.-Ges. Nov. 8th, 1929. (356,565.)

35,885. "High-frequency signalling systems." Marconi's Wireless Telegraph Co., Ltd. Dec. 23rd, 1929. (356,584.)

35,910. "Electric heating units." British Thomson-Houston Co., Ltd. Nov. 30th, 1929. (356,586.)

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1,341. "X-ray apparatus." C. H. F. Muller Akt.-Ges. Jan. 17th, 1930. (356,622.)

2,960. "Antenna systems." Marconi's Wireless Telegraph Co., Ltd. March 14th, 1930. (356,635.)

4,161. "Dynamo-electric machine sets for speed control." International General Electric Co., Inc. Feb. 10th, 1930. (356,643.)

5,025. "Electric twin cables." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 22nd, 1930. (356,647.)

18,639. "Electrical distribution boards, fuse boxes, and the like." Simplex Conduits, Ltd., and H. F. McLoughlin. Sept. 30th, 1930. (Divided application on 29,222/30.) (356,655.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 23rd:—

Rectigor. No. 521,631. Class 8. Instruments and apparatus for use in wireless telegraphy and telephony.—Société Hewittic, Paris. (British representatives: J. S. Withers & Spooner, Staple House, 51-52, Chancery Lane, W.C.)

Elpro (lettering and design). No. 524,552. Class 8. Wireless telephonic and telegraphic apparatus and parts thereof, electric accumulators and batteries (not for medical purposes).—Electric Products, Ltd., 9a, Queensway, Ponders End, N.

Lafayette Duo-Symphonic. No. 524,142. Class 8. Radio receiving sets and parts.—Wholesale Radio Service Co., New York. (British representatives: F. B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.)

Rhythm. No. 524,820. Class 8. Instruments and apparatus for radio signalling, electric radio-gramophones, etc.—J. H. Cook, 51, Monks Road, Lincoln.

Instamat. No. 525,019. Class 8. Wireless telephonic and telegraphic instruments and apparatus and parts thereof.—R. R. Ltd., 159, Borough High Street, S.E.1.

Hot Shot. No. 525,093. Class 8. Electric batteries (not for medical purposes).—E. J. Sheppard, trading as the Southend Magneto Works, 922, London Road, Leigh-on-Sea.

Zonophone. No. 525,104. Class 8. Apparatus, instruments, and devices for the recording, reproduction, transmission or reception of sound, television apparatus, thermionic valves, etc. —Gramophone Co., Ltd., Hayes, Middlesex.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abbey Hulton (STAFFS).—Housing scheme, Greasley Road; Sutton trustees.

Aylesbury (BUCKS).—Houses (20) for the T.C.; borough surveyor.

Banbury.—Alterations and extensions to the Norton Infirmary, Oxford Road; W. & J. Bloxham, builders, 1, Warrick Road.

Bedford.—Extensions, handicrafts centre, Harpur Central School; G. P. Allen, architect.

Bexhill-on-Sea.—Houses (10), St. George's Road; H. H. Ford, Collington Avenue.

Bicester (OXON).—Housing scheme for the U.D.C.; H. T. Smith, surveyor.

Birmingham.—Cinema, Coventry Road; H. H. Reynolds, 31, Wycliffe Road, Handsworth.

Bishop's Stortford.—Extensions, Haymeans Institution, for the Hertfordshire C.C.; J. M. Sheppard, architect.

Brighton.—Alterations, 7, Buckingham Road; Brighton and Hove Dental Hospital. Alterations, 63-6, North Street; Joseph Smith (Brighton), Ltd.

Bristol.—Maternity clinic, Marybush Lane; city engineer.

Bromley (KENT).—Houses (38), Southborough and Magpie Hall Lane, for C. H. Morrell. Houses (38), Roslin Way; H. F. Thoburn, architect.

Bucknall (STAFFS).—Houses (330), Longton Road, for A. Lilley; Jervis Madew, architect, Newcastle.

Camelford (CORNWALL).—Church; Rev. A. R. O. Apps, rector.

Chelmsford.—Houses (21), off Wood Street; W. J. Wade. Shops and flats, Moulsham Street and Friars Place; E. Ryder.

Chester.—Extension of sewage disposal works; Chas. Greenwood, city surveyor, Municipal Offices.

Chester-le-Street (DURHAM).—Masonic hall; A. H. Fennell, architect, Bridge End Chambers.

Chipping Norton (OXON).—Houses (34) for the R.D.C.; surveyor.

Chorley.—Pump house, Botany Bay; Liverpool Corporation water engineer.

Cleethorpes.—Primitive Methodist schools, Beaconthorpe (£2,500); trustees.

Coalville (LEICESTER).—R.C. church; Rev. J. Degen, parish priest.

Coleshill (BIRMINGHAM).—Sewage purification works (£14,000); Birmingham Tame and Rea District Drainage Board.

Coventry.—Clearance schemes, Much Park Street and St. John Street areas; city engineer. Rebuilding Smithfield Hotel; W. H. Jones & Sons, Ltd., builders.

Croydon.—Alterations and additions, 43-5, High Street; Gordon & Gordon, Finsbury House, Blomfield Street, E.C.2. Showrooms, 75-8, North End; E. Bates, 7, Queen Victoria Street, E.C.4. Workshop, Bedford Park; E. H. Smith (Croydon), Ltd., 48, Wellesley Road. School, Kensington Avenue (£9,939); S. E. Adams, Westcliff-on-Sea.

Deal.—Infants' school for the borough E.C.; director of education.

Dewsbury.—Houses (40), Ravensthorpe, for the T.C.; borough architect.

Doncaster.—Extensions to premises of the *Doncaster Chronicle*, Scot Lane; T. Johnson & Sons, builders, Bentley Road.

Douglas (I.O.M.).—Re-erection of bakery, Victoria Road, for J. J. Crellin.

Dudley.—Houses (92), Wolverton Road estate (£25,656); William Cooper & Son. Church, Nith Place; Bethel Evangelistic Society. Offices, Priory Road; Midland Counties Mutual Benefit Approved Society. Infants' school, Swan Street, Netherton, for the E.C.

Durham.—Extensions to C.C. Asylum, Sedgefield; Mr. Sharpe, architect, Old Elvet, Durham. School, Springwell (320 places), for the county E.C.; F. Willey, architect, 34, Old Elvet.

Elgin.—Hospital; County Public Health Committee.

Eton.—Sewage works, Iver (£55,000); R.D.C. surveyor.

Feltham (MIDDLESEX).—R.C. church and school; Rev. W. Wood, parish priest, St. Lawrence's Church.

Gateshead.—Alterations to the Duke of Cumberland Hotel; S. H. Lawson, architect, Emerson Chambers, Newcastle.

Glasgow.—Alterations and additions to the premises of Messrs. John Clen & Co., Ltd.; Thaw & Campbell, Ltd., builders, 136, Paton Street.

Hanley.—Alterations, Grand Theatre, Trinity Street; Johnson Bros. (Hanley), Ltd. Alterations, Imperial Picture Palace, Glass Street; Arthur Salt.

Harpenden.—Alterations, children's home, for the Hertfordshire C.C. (£1,452); W. Claridge & Son, Harpenden.

Hastings.—Joint aerodrome; Bexhill and Hastings Corporations.

Hemel Hempstead.—Extensions, Hempstead House Institution, for the Hertfordshire C.C.; W. H. Hobday, architect. School for the borough E.C.; Major Maule, architect.

Honiton (DEVON).—Houses (36) for the T.C.; Coles & Squires, builders.

Lanarkshire.—Houses (10), Chapelhall, with electric lighting work, for the C.C.; P. C. Smith, architect, 13, Clydesdale Street, Hamilton.

London (BERMONDSEY).—Flats (28), Grange Walk; B.C. works manager. (ILFORD).—Houses (45), Roxy Avenue and Flora Gardens, for P. Triplete, Ltd. Houses (20), South Park Terrace, for Holland Bros. Market, Ilford Lane, for G. F. Siegerts. Houses (74), Cedar Park Gardens; F. Smith. County Court, High Road; H.M. Office of Works, Alterations, operating block, King George Hospital; C. J. Dawson, Son and Allardyce. Development, Mossford Green Estate; Hobbs Bros. Additions, Seven Kings Baptist Church, Cameron Road; Robinson Bros. Nine shops, Eastern Avenue; J. A. Dartnall. (NORWOOD).—Alterations and additions, cottage hospital, Hermitage Road; Marsh & Sons, Westow Hill, S.E. (UPPER NORWOOD).—Shops, Lower Addiscombe Road; Bethell and Swannell, 16a, John Street, W.C.2. (CATFORD).—Houses (22), Tewkesbury Lodge estate, Westwood Park; Hugh Macintosh. (EAST HAM).—Eight shops and showrooms, Central Parade; Lee, Dickins & Co. (LEE).—Buildings at corner of Old Road and High Road; J. P. Briggs. (LEWISHAM).—Houses, Rossil Road, Vicars Hill; A. McDougall. (SYDENHAM).—Houses and flats, High Street and Round Hill; W. J. C. Kane.

Lydney (GLOS.).—Houses (23) for the R.D.C.; surveyor.

Maidstone.—Extensions to business stores, Week Street, for Messrs. Gergel.

Manchester.—Additions to works for Messrs. P. Frankenstein and Sons (Manchester), Ltd., Culceth Lane, Newton Heath; A. Winstanley, architect, 15, Great Ducie Street.

Mansfield.—Houses (50), Ravensdale estate; Borough engineer. Additions to factory, Stockwell Gate; Mansfield Shoe Co., Ltd. Alterations and additions to Welbeck Hotel, West Gate; James Hole & Co., Ltd.

Milton (STAFFS.).—Houses (56), Carmountside estate, for the Stoke-on-Trent Corporation (£20,000); C. Cornes & Son, Hanley.

Morecambe.—Houses (56), Brentlia Crescent; J. H. Atkinson. Estate development, Homfrey Avenue; A. Heathcote. Engineering works, Westgate; R. H. Kay.

Moxley.—Extensions, small-pox hospital (£3,000); South Staffs. Joint Hospital Board.

Newbury.—Alterations and additions, Northbrook Street; F. W. Woolworth & Co., Montague Burton, Ltd., and Blacket and Turner & Co., Ltd.

Newcastle-on-Tyne.—Social club and institute, Westgate Road; S. J. Stephenson, 2, Saville Place. Rebuilding of hotel premises, Newgate Street; J. F. Simpson, builder, Northumberland Road. Alterations and improvements to Primitive Methodist church; T. E. Ridley, builder, 7, Moor Crescent, Gosforth.

Newton-le-Willows.—Houses (100) on the Mesnes housing site for the Newton-in-Makerfield U.D.C.; J. A. Massie & Sons, builders, Barkers Lane, Ashton-on-Mersey, Sale, Cheshire.

Northern Ireland (ROSSNAKILL, Co. LONDONDERRY).—Public hall; W. N. Lecky, hon. sec., Public Hall Committee.

Northumberland.—Schools at Bedlington, Cramlington, East Chevington, Earsdon, and Hexham, for the C.C.; W. W. Tasker, county architect, 17, Claremount Place, Newcastle.

Norwich.—Two schools for the city E.C.; education architect.

Orrell (LANCS.).—Housing scheme, Park Road, for the U.D.C.; surveyor.

Pwllheli.—Catholic church, Morfa Lodge estate, Borth Road, Portmadoc, for the Rev. Leopold Cunningham, St. Joseph's Church, Church Street; Signor Rinvolucri, Bryn, Conway.

Rishton.—Senior school; secretary to the district (No. 9 area), Education Sub-Committee.

Rochdale.—Vagrants' wards, Birch Hill Institution (£5,500); clerk to the Public Assistance Committee.

Rottingdean.—Extensions, North End House, High Street; Sir Frederick Jones.

Ryton-on-Tyne.—Houses (96) for the U.D.C. (£33,790); Newcombe & Newcombe, Eldon Square, Newcastle-on-Tyne.

St. Albans.—Extensions, Oster House Institution, for the Hertfordshire C.C.; Alfred Saxon, Snell & Phillips, architects.

St. Helens (LANCS).—Houses (40), Leach Lane, Sutton, for Twist Bros. Houses (320) for the T.C.; A. P. Statham, borough engineer.

Sandbach (CHESHIRE).—Factory, Wheelock, for the Ozone Chemical Co., Ltd., Talke.

Scarborough.—First section for the Hinderwell Council School for the T.C. (£20,000); T. Jaram & Sons, builders, Gladstone Street.

Selby.—Houses (28) for the U.D.C., Flaxley Road; Blenkinsopp & Scatchard, chartered architects, Park Street.

Smethwick.—Houses (400), Warley estate; borough engineer.

Stirling.—Cinema, Maxwell Place (2,000 seats), for the Associated British Cinemas, Ltd., London; the secretary.

Stoke-on-Trent.—Drapery premises, Baker Street and Swan Street, for the Co-operative Society, Ltd.; J. Meiklejohn & Sons, builders. Extensions, maternity hospital; Stoke-on-Trent, city engineer.

Thorne (YORKS).—Church, Field Road, Stainforth, for the C. of E. Authorities; J. Blythe Richardson, architect, 26, Printing House Street, Doncaster.

Tonbridge (KENT).—Houses (22), Downingbury estate, Pembury estate, Pembury, for the R.D.C.; Frank Harris, surveyor, 48, Pembury Road.

Tynemouth.—Rehousing scheme, Liddell Street (£25,000); and conversion of premises, North Shields, for the T.C. (£20,000); J. L. Beckett, borough engineer, Howard Street, North Shields.

Waddon.—Houses (136), Croydon Corporation estate; borough engineer.

Warlingham.—Extensions, mental hospital, for Croydon Corporation (£51,702); Holland, Hannen & Cubitts, Ltd., contractors.

Welwyn (HERTS).—Houses (54) for the R.D.C.; Bennett Bros., builders, Letchworth.

West Hartlepool.—Schools; rector, St. Joseph's R.C. church.

West Riding.—Senior school (280 places), Dormanstown, Redcar; J. L. Coverdale, architect, County Hall, Northallerton.

Wolverhampton.—Re-erection of factory, Fern Road, for J. Holmes (Confectionery), Ltd. (£5,000).

Worcestershire.—School (1,440 places), Warley, Oldbury, for the E.C.; director of education.

York.—Improvements and alterations to Trafalgar Bay Hotel; Shepherd & Son, contractors, Bluebridge Lane. Re-erection of waggon shops and saw-mill, Leeman Road, for the London and North-Eastern Railway Co.